Amazing Case Roundup!
The latest computer enclosures: torture-tested and verdictized

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Ed Word

Are you there, Internet? It's me, Will

Please send feedback and cake that's delicious and moist to ***will@maximumpc.com.***

Have you ever heard of this thing called "the Internet"? It turns out that it's a great platform for publishing information. Color me impressed! I think this "Internet" thing just may change the future of magazine publishing.

Seriously though, I'm super-stoked to share the next phase of *Maximum PC*'s plans for world domination. First off, on MaximumPC.com we're going to post time-sensitive content much, much earlier than we have in the past. Our current strategy of posting reviews months after everyone's stopped caring is, admittedly, pretty lame. Starting with this issue, we'll be posting our reviews online as soon as they're written.

I don't want anyone who's paying for our magazine to feel as though they're buying stale content, so starting with this issue, we're rejiggering our reviews section. The number of pages devoted to reviews will shrink, but the reviews that do run in the magazine will be bolder and more visually lush, and will only focus on the highest-profile gear. These rock-star reviews will still appear online, mind you—along with all the other reviews that would have previously run in the magazine, but the online versions won't have all the visual majesty of what readers find in print.

Regardless, from here on out, MaximumPC.com can be your first stop for the hard-hitting reviews you love—from external storage to audio gear to displays, we will continue to cover it all.

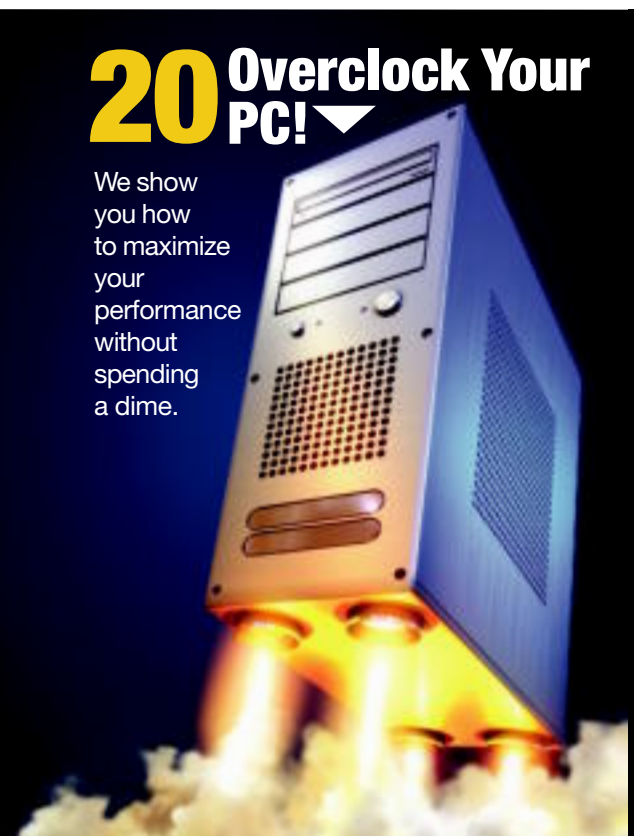
Because we're running fewer reviews in the magazine, we'll be able to dedicate these "extra pages" to other types of content. We're going to expand the Ask the Doctor and How-To departments, as well as deliver bigger, bolder feature stories. Naturally, though, when we get the scoop on a breaking story, we'll post it online lickety-split.

We'll be able to harness all the tools at our disposal to bring you the in-depth tech news, brutal product reviews, and insightful feature stories you demand from *Maximum PC,* in the format best suited to the content, whether it's print or online. We want *Maximum PC* to be your number one source for everything PC.

To help get the wheels turning, Katherine Stevenson will be taking on a new role as deputy editor of the magazine, helping me keep print and online running smoothly. Congratulations, Katherine!

I'm extremely excited to move more content online, but I'd like to get your opinion as well. Don't hesitate to drop me a line at will@maximumpc.com and let me know what you think!

Features



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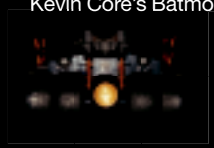

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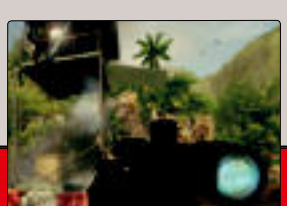

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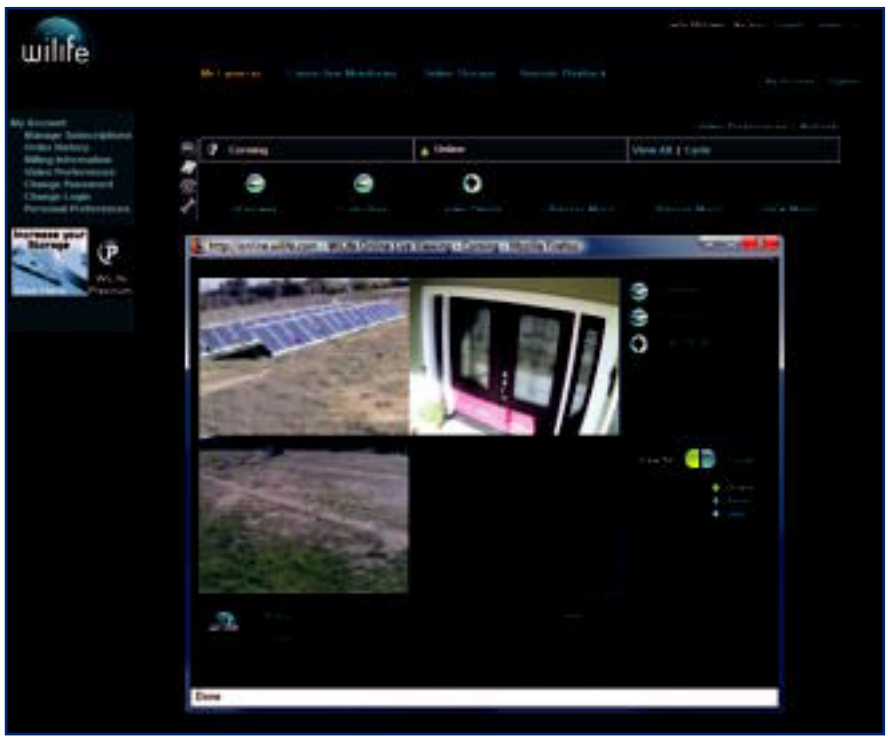
The Home Is Going Digital

High tech is moving into the living room—and the kitchen, bedroom, and garage, too



WiLife's online video-surveillance system enables homeowners to monitor up to six indoor and outdoor cameras over the web. Logitech bought the company for $24 million in November 2007 to expand its presence in the digital-home market.

So many attempts to bring the worlds of PCs and consumer electronics together have failed that the word "convergence" prompts snickers from journalists. But the market is poised for explosive growth, according to a new market study published by Parks Associates and EHX Publishing.

Oddly enough, it's not the PC that's driving this train, according to the authors of this study; it's the rapid adoption of flat-panel displays. "Consumers," said Bill Ablondi, director of channel research at Parks Associates, "want to connect these devices, as well as their PCs, game consoles, and media servers into entertainment networks with Internet access." The study predicts the size of this market will grow to $17 billion within the next five years—and that number doesn't take into account consumers who build their own networks.

Computer manufacturers such as Sony and HP clearly want a piece of this pie, but they're taking very different roads to get there. Sony's not using the C word, but Xavier Lauwaert comes close when he describes the market for the digital home. Lauwaert, Sony's VAIO product manager, told us in a recent interview that "the digital home market is only vaguely defined, but I see it as the merging of consumer electronics and IT."

Sony retreated from the desktop PC market several years ago, but its VAIO brand remains strong in the notebook arena, and according to Lauwaert, the company sold a significant number of its CableCARD and Blu-ray-equipped VAIO XL3 media center PCs in 2007.

Sony is expected to announce a successor to its CE-like VAIO XL3 media center PC at the 2008 Consumer Electronics Show in January.

HP is taking a different approach. The company discontinued its Digital Entertainment Computer line, but as HP's John Orcutt told *Maximum PC* in an interview last year, "We never got out of the media-center PC market. We [discontinued the] DEC line because the PC doesn't have to be in the living room anymore." HP now seems to be taking a three-pronged approach to the market, with its innovative TouchSmart PC, entertainment-oriented Pavilion HDX notebook, and headless MediaSmart Server running Microsoft's Windows Home Server.

But we see the digital home encompassing more than entertainment—and so does Logitech. The company followed up its 2004 acquisition of Intrigue Technologies (best known for its innovative Harmony remote controls) and 2006 buyout of Squeezebox-maker Slim Devices by snapping up WiLife in November. WiLife designs and manufactures the LukWerks video-surveillance system, which operates on a powerline network and can stream video to remote clients via the Internet.

New wireless technologies such as Z-Wave and ZigBee (IEEE 802.15.4) are enabling do-it-yourselfers to add extensive observation and command features to their homes and apartments, allowing them to monitor and control their lighting, appliances, temperature, and more. Motion and moisture sensors can even alert homeowners to break-ins and leaks via email or MMS.

As this market expands, so will *Maximum PC*'s coverage. It's an exciting time to be a geek.

The GeForce 8800M GTX will be faster than Nvidia's SLI mobile parts.

Mo' Better Mobile

Get ready for a new generation of mobile DX10 parts. Nvidia's new top-end GeForce 8800M GTX features 96 stream processors, a 500MHz core clock, an 800MHz memory clock, a 512MB frame buffer, and a 256-bit memory interface. The 8800M GTS is essentially the same but with 64 stream processors. The company says GTX performance is better than that of a GeForce 7950 GTX mobile part in SLI mode.

A Terabyte Thumb Drive?

A little ion shuffling could mean big things for the consumer electronics space

Breakthrough research from Arizona State University could bring massive amounts of storage to thumb drives within two years. As manufacturers continue to decrease the size of flash memory components—specifically, the insulating layer around the flash transistor—the risk of data corruption and loss grows. ASU's memory technology, programmable metallization cell (PMC), uses silicon oxide and copper to create nanowires between electrodes. These virus-size bridges record binary ones and zeros and present a much more stable alternative to the electronic charge that stores bits in flash memory.

Given that PMC chips use common components already found in chip manufacturing, the new memory can be created with minimal additional costs.

Soon, Corsair's 16GB thumb drive will seem quaint.

Google Unleashes an Android

After months of speculation, Google recently announced its entry into the crowded mobile market. However, instead of designing the long-rumored Gphone, the search giant released Android, a Linux-based mobile OS. Google developed Android in conjunction with the Open Handset Alliance, a consortium of mobile service providers, handset manufacturers, chipmakers, and software developers, and the company has recently made a free, downloadable development kit available. To help spur innovation, Google is also offering $10 million in prizes to developers, in awards ranging from $25,000 to $275,000.

While the OS itself is open, Google has placed no restrictions on how the platform is utilized, so service providers could, for instance, remove VoIP capabilities from Android handsets in order to tie users to income-generating voice minutes. In the United States, Android-based devices will initially be available on Sprint's and T-Mobile's networks, with numerous handset manufacturers planning to release devices in early 2008.

AT&T, which has a major stake in Apple's iPhone, is not a member of the OHA; as to whether the service provider would ever offer Android-powered phones, a spokesperson stated, "AT&T does not comment on what it might or might not do in the future."

While Google hasn't directly explained how it plans to generate revenue from Android, the OS will make it easy to use Google's entire suite of apps on mobile devices, bringing an almost PC-like experience to cell phones—and more mobile users on the web almost certainly means more eyes on the search giant's Ad Sense-generated advertising.

TOM **HALFHILL**

AMD's Odd Phenom

Soon after AMD announced its new triple-core Phenom processor, the jokes began. Some people think a multicore processor with an odd number of cores is...well, odd. Others ridiculed AMD for making triple-core chips by disabling one core on a defective quad-core die. Intel CEO Paul Otellini cracked, "We see a distinct advantage in having all the cores on our dies work."

Actually, there's nothing odd about an odd number of processors. For 30 years we've had PCs with only one processor, and that's an odd number.

But seriously, there's no technical reason a multicore chip can't have any number of processor cores. Sometimes it's easier for chip designers to lay out an even number of cores because the die will be nearly a true square, which fits more efficiently on circular silicon wafers. However, different layouts are possible and often desirable. Designers can surround an odd number of cores with caches, buses, and other logic to achieve a square die. Indeed, such layouts are becoming more common as microprocessors integrate more components. Remember that AMD's processors have on-chip memory controllers and soon will integrate graphics cores, too.

The slap that AMD is merely converting defective quad-core Phenoms into triple-core Phenoms hits closer to home. Rumors abound that AMD's production yields—especially for the new 45nm fabrication process—are terrible. These rumors are hard to verify because semiconductor manufacturers closely guard their yields as trade secrets.

Although poor yields are definitely bad, there's nothing wrong with salvaging chips by disabling the defective logic and relabeling the product. In the 1990s, Intel sold 486 processors either with (486DX) or without (486SX) an integrated FPU. Early 486SX chips were found to be 486DX chips with disabled FPUs.

More recently, some massively parallel processors have the ability to route around defective cores and keep working. One example is a 430-core chip from PicoChip Designs that's found in cellular and wireless-network base stations. Should PicoChip scrap an otherwise functional die because it has "only" 429 working processor cores? As PC processors integrate large numbers of cores, inevitably some cores will be defective. It will become commonplace to salvage those chips by disabling the bad cores. And that's fine, as long as the chips are honestly labeled.

Tom Halfhill was formerly a senior editor for Byte magazine and is now an analyst for Microprocessor Report.

GAME THEORY

THOMAS MCDONALD

Symphonies of Destruction

One fringe benefit of having a hardcore gaming laptop for a few months is that I've been able to dig deeply into the new generation of multiplayer action games with all the settings cranked up to the max and enjoy some truly spectacular hours of online homicide. And do it without being tied to my desktop. There's something about playing Quake Wars in bed that's just so wrong, yet so right. Four CPUs, one man, a bed: It's like some kind of über-geek fetish fantasy.

The real pleasure, however, comes from just how solid this generation of multiplayer action is. With Enemy Territory: Quake Wars, Team Fortress 2, and Unreal Tournament 3 forming the core of dedicated multiplayer action, and Call of Duty 4 and Crysis holding the flanks, we are positively swimming in top-flight game design for the online frag crowd.

To an outside observer, these games might all seem like more of the same in different wrappings. But to gamers who truly love online action, you couldn't have asked for three more radically different approaches than Quake Wars, TF2, and UT3. Each is like a musical composition in a different key.

In terms of pure personal appeal, Quake Wars is at the top of my list, since its use of classes and multiple fluid objectives manages to capture some of the feel of an ever-shifting battlefield. If the old Strogg/GDF matchup has grown a little tired, it's a minor complaint within a system that handles classes and their functions so well. What Team Fortress 2 lacks in objectives and complexity it more than makes up for with its fresh style, focused team play, and outstanding unit balance. And though I haven't logged time with the final version of Unreal Tournament 3, the material Epic has been showing certainly takes its work on Gears of War to the next level and places UT3 at the fast-and-frenzied instaspawn end of the spectrum.

It's simply wonderful, this late in the life span of the multiplayer action game, to see three teams wind up with such radically different approaches to the same concept. Only people who don't know the genre would see these titles as mere interchangeable carnage. That's like saying Mozart, Beethoven, and Brahms all sound the same because they wrote symphonies.

Thomas L. McDonald has been covering games for 17 years. He is Editor-at-Large of Games Magazine.

OCZ Buys Hypersonic

RAM vendor branches out into the PC market

In a buyout that has raised some eyebrows, RAM and PSU vendor OCZ will buy boutique PC-maker Hypersonic to help diversify its business.

Hypersonic will operate as a separate division, but some competing PC vendors are concerned about buying components from what is now a competitor. OCZ officials told *Maximum PC* that PC vendors shouldn't feel any threat, as the company has no plans to give preferential treatment to Hypersonic on RAM or other components.

OCZ's main purpose with the acquisition is to grow Hypersonic by giving it access to new markets and platform vendors that OCZ has relationships with. In the long term, it will help protect OCZ's business from the mercurial swings of the RAM market. In May, the company purchased PC Power and Cooling for $13 million.

Hypersonic's gaming rigs get a lot of attention, but real growth will likely happen on the laptop side.

Radiohead's Experiment Pans Out?

Radiohead made a bold move by offering its latest album, *In Rainbows*, as a name-your-own-price digital download, eschewing a record label entirely. According to ComScore, which tracks digital sales, 1.2 million people downloaded the album in October. Of these people, roughly 60 percent chose "free" as their price. The remainder paid an average of $8 in the United States, $6 worldwide.

Yet, despite most users getting the album for free (and at least another 500,000 people pirating it, even though it could be had gratis from the official site), Radiohead is looking to make a tidy sum: Without a label, the band gets a much bigger slice of the pie.

But is it enough? Radiohead's popularity and the tremendous publicity the release garnered no doubt boosted sales. Whether choose-your-own-price is a viable option for smaller bands, or even another Radiohead release, remains to be seen.

Major League Baseball Throws Curveball

Game footage purchased from MLB.com prior to 2007 features an abandoned DRM scheme, making the video unviewable

When MLB switched to a new digital rights management service, the DRM licensing keys from the previous service were invalidated. To replace previously purchased footage send an email to customerservice@website.mlb.com.

BD+ Cracked

Blu-ray's secret weapon against content piracy, known as BD+, has already been breached—just a few months after the added layer of copy protection began appearing in Blu-ray discs. Not surprisingly, fair-use champion SlySoft is responsible for the crack, which is reportedly available in the beta of the company's new AnyDVD HD disc-ripping app. Blu-ray backers can now stop claiming that their format is more secure than HD DVD.

AMD's Phenom Finally Surfaces

Next-gen AMD part goes toe-to-toe with Intel's low-end quad core

Quad-core Phenom features an L3 cache and is backward-compatible with Socket AM2.

After months of delay and name rejiggering, AMD has finally unveiled its next-generation Phenom CPU, but not without skepticism and concern.

The company didn't provide media outlets with early previews, opting instead to let the press touch the chip only under controlled circumstances just days before the launch. That prompted suspicions of damage control, but company officials told *Maximum PC* that the lack of early reviews was due to a shortage of parts.

Rob Enderle, principal analyst with the Enderle Group, said it's also quite possible that AMD is borrowing a page from Apple's playbook. Instead of dribbling out information months in advance, the company just might be trying to hit with the hype all at once.

We doubt Phenom will generate much hype, though. The company's fastest part planned for release, the Phenom 9700, runs at 2.4GHz, the 9600 runs at 2.3GHz, and the 9500 is clocked at 2.2GHz. That puts the chips on par with Intel's low-end quad-core part and well shy of Intel's fastest CPUs.

Japanese Consumers Buying Fewer PCs

People look to mobile devices to fulfill their online needs

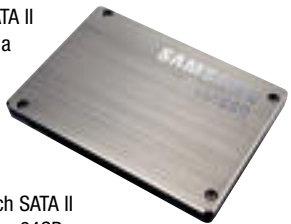
On any given day, the streets of Tokyo's electronics paradise, Akihabara, are teeming with individuals looking to buy everything from decades-old circuit boards to the latest micro-size media players. One thing people are buying in less volume, however, is PCs, making Japan the first country to see a sustained drop in desktop and laptop sales.

The change is fueled in part because many of the tasks Americans use PCs for are easily completed on mobile devices in Japan, where high-speed mobile data connections are cheap and ubiquitous. Email, music and video downloads, and web surfing are much more common on Japanese handsets and consumers seem more inclined to spend money on other consumer electronics than to upgrade to a faster rig.

FUNSIZENEWS

SAMSUNG'S SSD GETS SPEEDIER

Not so long ago Samsung's 64GB solid-state drives appeared on the scene to much fanfare, so we're sure its new SSD family featuring a SATA II interface can expect a warm reception in Q1 2008. Aimed at server and notebook storage markets, Samsung's new 1.8- and 2.5-inch SATA II drives will also feature 64GB capacity, but the transfer speeds will blow away those of any consumer drive available today—we're talking 100MB/s and 120MB/s read and writes versus current 50-80MB/s rates.



GOOGLE GETS GAS

Imagine being able to map the location of a nearby restaurant or notable landmark while you fuel your car. As of December 2007, 3,500 Internet-connected gas pumps will give you access to Google Maps. The pumps, made by Gilbarco Veeder-Root, feature a small LCD that offers directions to popular, predetermined destinations, and the results can be printed on the spot. If the pumps are well received, expect more, as well as the ability to enter any address of your choosing.

DRM-FREE MEDIA GETS CHEAPER

Apple is no longer charging a premium for music that lacks digital rights management. The price of the unencumbered tracks, designated iTunes Plus, is dropping from $1.29 to $.99, the cost of tracks containing DRM. Individual music labels will determine whether their tracks are sold "locked" or not.

YAHOO GETS CHEWED OUT

Yahoo CEO and cofounder Jerry Yang had some explaining to do before the U.S. Congress. He had to answer for the fact that Chinese citizens have been imprisoned based on personal emails Yahoo turned over to the Chinese government. Decried as a violation of human rights, Yahoo's actions call attention to the contradictory business practices of U.S. companies here and abroad.

FAMILY COMPUTERS

All-in-One Desktop **vs.** Notebook

Using a PC to manage a household is nothing new, but the concept of a household PC is. We see it as a second computer located in a central location—the kitchen is ideal—where it's accessible to everyone in the house. Such a machine needs to fill many roles, including communications, entertainment, and productivity. As the family's technology hub, it needs wireless network access, a big screen, and a built-in TV tuner. This isn't a gaming PC, but it should at least be competent in that respect.

So which formfactor is best suited to that role, a desktop machine or a notebook? Each has its obvious advantages and drawbacks. We've selected two of HP's consumer machines for this Head2Head: the TouchSmart IQ775, which comes with an innovative touch-screen display, and the Pavilion HDX, which is endowed with a massive 20.1-inch LCD.

BY MICHAEL **BROWN**

Notebook
HP Pavilion HDX
$4,275, www.hp.com

round 1 ENTERTAINMENT VALUE

Four applications measure a PC's entertainment value: television, movies, music, and gaming. Both machines have fairly large screens, both have integrated sound and speakers, and both are outfitted with TV tuners. Both machines are also limited to analog cable or satellite TV, since neither is equipped with CableCARD technology.

Surprisingly enough, however, the Pavilion HDX comes with a much-faster GPU: an ATI Mobility Radeon HD 2600 XT that renders it capable of playing DirectX 10 games. It's also outfitted with an HD DVD drive, compared to the TouchSmart's DVD. And since the notebook is outfitted with an HDMI jack, you can take it into the living room and connect it to your home-theater system. Or you can hang a bedsheet on the side of your house, plug the HDX into a video projector, and create a backyard drive-in.

WINNER: NOTEBOOK

round 2 ACCESSIBILITY

The great thing about mobile devices is that they're accessible from just about anywhere. You can balance your checkbook in bed, surf the web in the backyard, or play games during a long flight. But unless you establish a home base for the portable PC and everyone is extremely disciplined about putting it back there, family members will quickly become frustrated when they have to hunt down the notebook (and its power adapter, because the battery will inevitably be depleted) when they need to use it. And that's assuming someone hasn't taken it outside the house. Everyone will know where they can find the all-in-one PC.

WINNER: ALL-IN-ONE DESKTOP

round 3

UPGRADABILITY

The biggest drawback to all-in-one PCs and notebooks of all stripes is that they're notoriously difficult to upgrade. You can upgrade the memory in either type of machine, but swapping out the CPU, GPU, display, or any other key component is, or very nearly is, impossible.

WINNER: TIE

round 4

USABILITY

The Pavilion HDX's massive display leaves plenty of a space for a full-size keyboard—heck, there's so much deck space that HP fit a dedicated numeric keypad, a fingerprint reader, *and* a storage bay for a detachable Windows Media Center remote. But that doesn't change the fact that the keyboard is fused to the display, so you can't move one without shifting the other. The all-in-one PC's keyboard is not only detached, it's also wireless; you can use it on your lap if it won't fit on the desk. And while trackpads have improved consistently over the years, they'll never be as easy to master as a genuine mouse. Sure, you can plug an auxiliary mouse or keyboard into the desktop replacement notebook, but every peripheral you add reduces that machine's mobility, negating its core attraction.

WINNER: ALL-IN-ONE DESKTOP

round 5

PRICE/PERFORMANCE RATIO

Portability costs money. Nearly every component in a notebook PC costs more than its counterpart in a desktop machine because it needs to be smaller, consume less power, and generate less heat. The machine as a whole must be engineered to absorb knocks, bumps, and drops as it's carried from one location to the next. Touch-sensitive trackpads costs more than generic mice, and the list goes on.

Although some of the components in the all-in-one PC we selected are designed for mobile PCs, that isn't preventing HP from selling the TouchSmart IQ775 for thousands less than its decked-out Pavilion HDX desktop replacement.

WINNER: ALL-IN-ONE DESKTOP

All-in-One Desktop
HP TouchSmart IQ775
$1,600, www.hp.com

And the Winner Is...

HP's Pavilion HDX is the best desktop-replacement notebook we've ever tested. It's remarkably light and transportable, considering its gargantuan physical dimensions; it's equipped with a superfast CPU and GPU, and that display is absolutely lust-worthy. We can see plenty of situations in which a desktop-replacement notebook PC would be the ideal solution. But this isn't one of them.

You can't drag a rig like the TouchSmart IQ775 from one room to another, but you'll never need to track it down when you need to reconcile your checkbook, offload photos from your digital camera, or update your blog. With it anchored in place—ideally in a central location—it is easily accessible to everyone (and easy to monitor if you're worried about what websites your kids are visiting). And unlike a portable machine, it is capable of hosting home-control and home-monitoring applications (such as networked security cameras). The all-in-one PC is clearly the best candidate for a household tech center. MPC

Our consumer advocate investigates...

✓Tornado Transfer Issues ✓GeCube's Warranty ✓A $150 laptop?!

Roswell, ***watchdog of the month***

TORNADO GETS SUCKED IN BY WINDOWS VISTA

After reading ***Maximum PC's*** *review of the Data Drive Thru Tornado in the November issue, I purchased one; I routinely connect my laptop to another PC. The Tornado seemed like a good solution that didn't require mucking about with mapped drives and flaky network adapters.*

For the most part, the Tornado worked as advertised. However, I encountered problems when transferring a 24GB file between my laptop and a desktop computer (a Vista NTFS partition to an XP NTFS partition). Even though the laptop continued to show progress, the file on the desktop did not grow past about 4GB. When the transfer ended, I was left with 24GB on the laptop and a 4GB file on the desktop.

I attempted to contact the company using the technical support email links on its website, but the links did not work. I also tried emailing the parent company but received no response. Can you help?

—Chris

The Dog contacted Data Drive Thru about Chris's issue and a spokesman told the Dog that the company has no record of him calling or emailing the company. However, the spokesman agreed to make it right and contact Chris directly. For his part, the Dog tested the original Tornado that *Maximum PC* received and successfully copied a 10GB image from a Windows XP Pro machine to another Windows XP Pro machine. The original review was based on data transfers between Windows XP machines, as well. Both used NTFS, and the transfer was very fast.

The Dog did, however, have odd results when copying files between a Windows XP Pro rig and a Windows Vista Ultimate 64-bit machine. Similarly to Chris, a 48GB image file was truncated to 4GB, but a 10GB file made it through fine. The Dog spoke with a Data Drive Thru representative who said tests in its labs have been unable to reproduce such problems—large files have been repeatedly transferred using the device without a hitch. In fact, the company said only two people have complained about any problem with the device: Chris and now the Dog. Although there was no solution at press time, Data Drive Thru was closely working with the Dog and Chris to find an answer. For a solution—hopefully—watch this space. Woof.

The Tornado whips through large file transfers—unless you're using Vista.

BLAME YOUR BUTTERFINGERS

We recently purchased a Microsoft Zune and within a few weeks, the battery overheated and bulged, which caused the screen to crack. When we tried to return the player to Radio Shack, we were told that this problem was not covered by the warranty. We then contacted Microsoft and received the same response. We were also told that we could send in the unit and have it repaired—but for almost the original price of the device. I guess this is why so many people buy iPods. I wish we could get some help here.

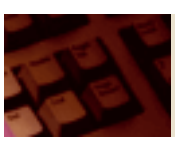
—Paul

The Dog spoke with a Microsoft spokesperson who denied that the problem was due to a design defect. She said Microsoft engineers have looked at broken units and have determined that cracked screens are the result of impact damage. She also added that a Zune is constructed in such a fashion that a crack in the screen may not appear until sometime after the unit is dropped.

A person, for example, could drop the Zune, pick it up, and not see that the screen was damaged. However, a few days later, a crack from the previous impact might suddenly develop. That person could understandably perceive this seemingly random occurrence of damage to be an engineering defect. But the Microsoft spokesperson said that in the company's examination of units with broken screens, all showed signs of internal impact damage indicative of a drop.

The spokesperson went on to explain that only one website—Engadget.com—has reported that cracks in the Zune's screens can occur when the player's lithium-ion battery overheats and bulges against the screen. She said no other sites have reported such problems. In fact, only one percent of customers have reported broken screens, according to Microsoft, and the majority of cracks have been due to impact damage.

So who is right? That's difficult to say. Obviously, Microsoft would not want to admit to another hardware problem following the disastrous problems with the Xbox 360. But Paul is the only person the Dog has heard from. If this were an engineering defect, we'd expect to hear from others. Perhaps they're forthcoming, but until then, the Dog is going to take Microsoft at its word. Maybe you should be more careful, Paul.



Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic the Dog on them by writing **watchdog@maximumpc.com.** The Dog promises to answer as many letters as possible, but only has four paws to work with.

TAKE IT TO THE STORE, NOT US

Dog, I've been having problems trying to reach videocard vendor GeCube. I purchased a GeCube X1950 XT card for Folding@home use, and it stopped working with 3D applications. It has not been overclocked. GeCube has not responded to my email.

—Mark Chams

A GeCube technician got in touch with Mark before the Dog could respond to Mark's letter. The tech explained that he had tried to contact Mark, but the email bounced. As proof, he included copies of the bounced email. The Dog was particularly struck by one portion of the tech's message to Mark. Instead of including instructions for returning product to the company, the tech instructs Mark to take the issue up with the store where he purchased the GPU.

The email reads, in part, "GeCube has agreements with the distributors to deal with warranty issues. If you need a replacement or want to have it repaired, please contact your vendor. The local distributors have their own rules to judge whether to provide a replacement or repair services for their customers."

It sounds like GeCube is passing the buck here. Most videocard vendors will directly warranty failed cards, and most prefer that end users contact them instead of sending parts back to the store. Under more direct questioning from the Dog, the GeCube technician finally admitted that the company would indeed warranty cards directly if the store goes out of business or if the card was a gift (a fact he failed to mention to Mark in his initial email). The consumer would have to pay to ship the card to GeCube, but it would at least be fixed.

For Mark, the issue was moot. Unhappy with GeCube's response, Mark did go back to his vendor. "It was really impossible to deal with GeCube," Mark told the Dog. "Lucky for me, Newegg kicks ass and simply RMA'd the card for me as a courtesy. I have no idea what Newegg will do with the damaged one—hopefully, return it to GeCube, but I didn't ask." The Dog agrees that GeCube's warranty support could use some improving.

MADE OF VAPORANIUM

Call me skeptical, but I have a hard time believing that this deal from Medisoncelebrity.com is really true. The company claims it has a laptop for sale with an Intel Celeron 1.5GHz CPU, a 14-inch widescreen X-bright LCD, 256MB RAM, a 40GB hard drive, 802.11g wireless LAN, an optimized Linux operating system, and preinstalled office and multimedia applications—all for $150.

While it's not a power-user rig, it's not bad for the price. That's why I'm asking you, Dog, is it for real or too good to be true?

—Ryan Hardy

GeCube prefers you take your bad card to the retailer, which will decide whether to replace it.

Call it too good to be true. So what exactly is going on with Sweden-based Medison? That's not clear, but your chances of actually getting the notebook you refer to are pretty much zilch. Nevertheless, when Medison announced the notebook, plenty of people decided to gamble $150 on the deal being for real.

By August, Medison had failed to ship any computers, but it did hold a press conference to allay people's fears and said that the notebooks would ship later that month. But as of this writing, no one has reported receiving the company's computers. In fact, the Dog could not find any instance of a customer actually receiving the notebook by the promised date.

Valdi Ivancic, Medison's managing director, told *Computer Sweden* that the company wasn't running a scam and invited anyone who couldn't wait to cancel their orders. In fact, Ivancic said, the credit card company that took the orders, 2checkout.com, would not actually put the charges through until the notebooks ship. Until then, the company will only place a hold on the charge.

During the interview, Ivancic, who is reportedly a 90 percent stakeholder in the company and a former politician, said he is also considering running for prime minister. OK, that's just plain whacky.

The company also claims it has bought a Brazilian company to help manage the logistics on the nonexistent product (which would what? Be shipped from Taiwan or China to be repackaged in Brazil?). If that isn't odd enough, the company says it doesn't plan to make any profit from selling the notebooks but instead expects to generate revenue by selling ad space on its website. The Dog believes Ivancic has a better chance of becoming prime minister than of his business model working out. Woof. MPC

OVERCLOCK YOUR PC

INCREASE THE PERFORMANCE OF YOUR CPU—FOR FREE! WE TELL YOU EVERYTHING YOU NEED TO KNOW TO DO IT SAFELY AND EFFECTIVELY

BY GORDON MAH UNG AND DAVID MURPHY

IF you're running your CPU at stock speeds, you're missing out on your PC's true potential, because processors often harbor power beyond their official specs. Your proc, for example, might be rated to run at 3GHz but is actually capable of operating reliably at 3.3GHz. There are myriad reasons for the hidden headroom, ranging from natural variance among parts (even those made from the same batch), to the manufacturers' practice of underclocking parts to meet market needs, to the improved capabilities of a part over the lifetime of its production.

The point is, you're not a true power user if you leave a CPU's hidden performance potential untapped. And the only way to release your proc's inner speed demon is to overclock it. This story will tell you how. Even if you've dabbled in the practice in the past, you'll want to read on. Because just as CPUs have changed over the years, so has the art of pushing them to their limits. Over the following pages we'll tell you everything you need to know about overclocking today's CPUs, be they AMD- or Intel-branded. We'll explain what's involved, how to determine what your hardware is capable of, and how to achieve optimal results. Most importantly, we'll tell you how to overclock safely. Indeed, overclocking is serious business and should never be taken lightly.

When you tamper with the internal workings of your computer's parts, you do so at your own risk. Overclocking can damage, or even destroy, your CPU, motherboard, RAM, or other system components, and it can void the warranty on those parts. So consider yourself warned about the potential hazards! That said, you're unlikely to harm your hardware if you overclock with extreme caution and care. And following the advice and instructions we lay out here will help you. So let's get started!

ILLUSTRATION BY ADAM BENTON

THE BASICS OF CPU OVERCLOCKING

Pushing your processor to new heights can be extremely rewarding—if all goes right. Take the time to understand the concepts of overclocking and the factors that can affect success

DETERMINING A CPU'S SPEED

There's simple math that determines the clock speed of any CPU. Each CPU has a fixed internal number called the clock multiplier. That number multiplied by the reference clock of the front-side bus determines the stated clock speed of the processor. For example, an Intel 2.66GHz Core 2 Quad Q6700 has a clock multiplier of 10. The stock system bus speed for this processor is 1,066MHz. But wait, 1,066MHz multiplied by 10 equals 10GHz. What gives? Intel's front-side bus is quad-pumped, so its actual reference clock is 266MHz (1,066MHz divided by four). That makes the clock speed of a Core 2 Quad Q6700 10 times 266MHz for 2,660MHz, or 2.66GHz.

This same math applies to AMD's Athlon 64 CPUs, although, technically, they have no front-side bus; instead, a HyperTransport link connects the CPU to the chipset. A 2.6GHz Athlon 64 X2 5000+, for example, operates on a 13x multiplier using a 200MHz link—the actual HyperTransport link connection runs at 1GHz, as it operates on a 5x multiplier.

You can overclock both Intel and AMD CPUs by increasing the multiplier setting, increasing the "front-side bus," or both. By using a combination of a multiplier and FSB overclock, you may achieve higher speeds with more stability. Depending on your situation, a combination of both may give you the best overclock, as your motherboard may simply not be up to running at excessively high speeds.

MULTIPLIER LOCKING

CPU manufacturers will take measures to ensure that a processor runs at its intended speed by locking the multiplier. This fixes the multiplier setting, so it cannot be changed in the BIOS. This is done primarily to keep CPU "re-markers" from selling cheaper parts as more expensive ones, but it also serves to thwart overclockers.

But not every chip is locked. Intel's Extreme series of CPUs does not feature multiplier locking nor does AMD's FX series or some of its new Black Edition CPUs. This gives overclockers who pay the extra price of admission more flexibility in their adventures. A 2.66GHz Core 2 Extreme QX6600 CPU, for example, can be overclocked to 2.93GHz simply by increasing the multiplier from 10 to 11 without having to resort to front-side bus overclocking.

THE ROLE OF CORE VOLTAGE

When you overclock, you essentially run the CPU out of spec. Upping a CPU's core voltage allows you to run a CPU *way* out of spec by further increasing your overclocking headroom. For example, a stock Intel Core 2 Duo E6600 running at 2.4GHz eats about 1.2 volts. To get the same CPU up past 5.6GHz, one overclocker increased the core voltage to 1.9 volts. As you can imagine, if AMD and Intel designed a CPU to operate at a certain voltage, running it higher will greatly decrease the life expectancy of the CPU. This is the most dangerous element of overclocking. The worst we've personally seen from overclocking a CPU via its multiplier or front-side bus is instability or a corrupted OS. But by adding a ton of voltage to a processor, you risk nuking it. Proceed with caution!

HOW DO I KNOW IF MY CPU IS OVERCLOCKABLE?

As a rule of thumb, a very mature CPU production line will yield parts that are capable of running at much higher than rated speeds. So, while it's not a guarantee, overclockers are generally better off with later-stepped CPUs.

An even better way to determine your processor's overclocking credentials is to download CPU-Z (www.cpuid.com). This freeware utility will identify your Intel or AMD CPU and tell you such nitty-gritty details as the stepping and revision of the proc. Steppings and revisions are internal labels that Intel and AMD use to denote versions. A step denotes larger changes while a revision indicates fairly minor tweaks.

Once you find out that your retail 2.4GHz Core 2 Quad Q6600 is a revision G0 you can rejoice in knowing that it runs cooler and can withstand more heat than the previous B3 step version. You learn those particular CPU qualities only by doing research, and the best resources are online overclocking databases. Almost every enthusiast PC site has a section devoted to overclocking, where users post details of their own experiences with various CPUs. MaximumPC.com, ExtremeSystems.org, and FiringSquad.com all include areas for users to discuss overclocking exploits.

HAVE THE RIGHT HARDWARE

Your CPU isn't the only part that matters in your quest for more speed. Here are the other components to care about

MOTHERBOARD

You get what you pay for and, generally, a cheap-ass motherboard will yield marginal overclocking results. The more expensive the motherboard, the more likely it is to have better components and better overclocking capabilities. That doesn't mean all sub-$100 mobos are overclocking duds, but you'll have to troll the forums and customer reviews on enthusiast sites to determine if a cheapo mobo can OC.

One additional tip: If you're buying a motherboard for overclocking, you'll likely have the best success with the latest "spin." Mobo vendors update their boards with fixes and more recently built boards will usually overclock better.

POWER SUPPLY

We've long said that the PSU doesn't get the attention it's due, and that's especially true when it comes to overclocking. The fact is, the need for clean, reliable power is of utmost importance if you're pushing a CPU, RAM, and motherboard to the edge.

If you have a high-compression engine in your street racer, are you going to fill it with 85 octane fuel? A cheap power supply is the equivalent of questionable Kwik-E-Mart gasoline. For overclocking, you don't need a 1,200-watt PSU, but you do need a name-brand unit. Generally, it's safer to have a PSU that delivers a bit more power than you need. While it may not be the most power-efficient scenario, a 750-watt PSU running at 450 watts will probably live longer than a 500-watt PSU running at 450 watts.

You don't need a 1,200-watt PSU like this PC Power & Cooling Turbo-Cool, but you do need a quality, name-brand unit.

COOLING

Excessive heat can cause system instability, so it's essential to keep your overclocked CPU cool. To achieve extremely high overclocks, some hobbyists bathe their CPUs in liquid nitrogen. Others use phase-change units (essentially tiny freezers) to push 3GHz chips past the 5GHz mark. The point is, you can't expect to push your 1.86GHz proc to a reliable 4GHz using a $12 heatsink. Know your overclocking goals and then choose your cooling accordingly. Air cooling is the most modest solution, followed by water cooling, peltier/liquid combinations, phase change, and exotic liquids, such as liquid nitrogen. Also remember that the extra heat produced by overclocking will warm up the rest of your machine, so you may have to upgrade your case's cooling or the case itself if you experience overheating issues. For our CPU cooling recommendations, see page 34.

MEMORY

In the old days the front-side bus's speed was tied to the speed of the system RAM, so you had to overclock both. That's no longer the case, but some folks still prefer to give their RAM some extra juice. This is the purpose of pricey, high-performance RAM. It's been certified by the RAM manufacturer to operate at a given "overclocked" speed. We say overclocked because RAM speeds and timings are actually spec'd by an organization called JEDEC. The top standard speed of DDR2 today is 800MHz. Overclockable DDR2 RAM generally runs in the 1,066MHz range, with some pricier modules pushing 1,250MHz. While it's not necessary to overclock your RAM to overclock your CPU, there are some instances when you will get improved performance if the FSB and RAM run at similar speeds that are closely synced. Some applications will also favor the increased bandwidth of overclocked RAM. Your research will help you determine if this applies to your parts.

High-speed, overclockable memory is not mandatory if you only intend to overclock your CPU.

OVERCLOCKING AN OEM MACHINE

So, you're ready to crack open your business-class Dell, HP, or Gateway and give it some gusto, eh? *Fugetabout it*. The overwhelming majority of OEM machines and notebook PCs prevent overclocking to reduce complaints from the chumps who OC recklessly and ruin their machines. Even motherboard brands known for overclocking may be neutered in an OEM machine. Got it? OK, now we're going to contradict ourselves. Some OEM boxes do overclock. Dell's XPS and Hewlett-Packard's Blackbird PCs are designed to overclock. Still, for the most part, overclocking and OEM machines don't mix.

OVERCLOCKING INTEL

The steps we take to push our Core 2 Extreme QX6700 beyond its 2.66GHz stock speed can be applied to any modern Intel processor

BACK UP YOUR DATA

While the risk of hardware loss is generally very low, there's always the possibility of OS corruption or data loss.

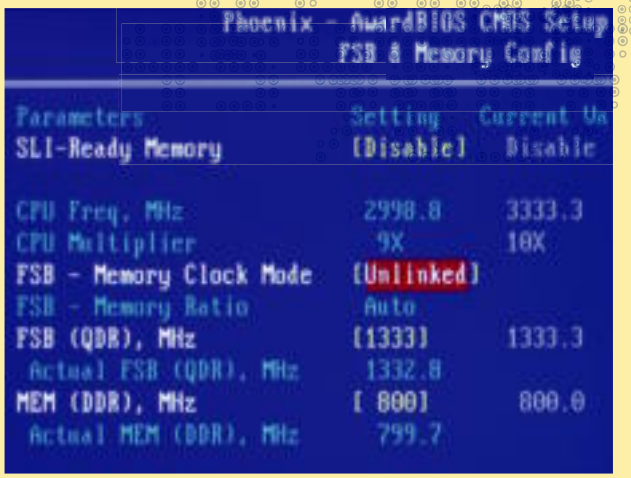
ENTER YOUR BIOS

Get into your BIOS by hitting the Del, F1, or F2 key during boot. The key will vary by motherboard, so check your documentation if you're not sure what to press. Once in the BIOS, you will need to find the appropriate configuration screens for overclocking. The screens we refer to in our examples are specific to the EVGA 680i SLI motherboard—they will differ from BIOS to BIOS. Your mobo manual or an online search can provide guidance, but often you just need to dig around.

GOOSE YOUR CPU'S MULTIPLIER

One way to overclock your Intel CPU is to increase its multiplier—if it's unlocked, which is true for any Extreme-class Intel processor. The downside to doing a multiplier-only overclock is that there is very little granularity. Taking a 2.66GHz Core 2 Extreme QX6700 from its stock 10x multiplier to 12x jumps you all the way to 3.2GHz. If you want to hit 3.1GHz, a multiplier overclock won't let you do it. Try increasing your CPU's multiplier just a notch or two (in our BIOS, the multiplier setting is in Advanced Chipset Features, System Clocks). Then reboot your system and see how it runs. If your system crashes or won't start, see Step 7.

INCREASE YOUR FRONT-SIDE BUS SPEED



The other, more likely, way to overclock your Intel CPU is through the front-side bus. By bumping the FSB beyond its stock 800MHz or 1,066MHz, you increase your CPU's clock speed. On the majority of CPUs, this will be the sole overclocking option, as only the most expensive Intel chips are unlocked. On our EVGA 680i board, we went into Advanced Chipset Features, FSB & Memory Config.

Here, we set the FSB Memory Clock Mode to Unlinked. This effectively separates the RAM clocks from the front-side bus. (If your chipset doesn't allow you to unlink the RAM, you will need to choose an FSB-to-RAM speed ratio; make sure your choice keeps you within your RAM's spec. See Step 6 for more info.) Increase your FSB by just 20MHz increments. Reboot with each increase to see if your machine will boot (if your system crashes or fails to reboot, see Step 7). With the multiplier set at its stock 10x, we pushed our 2.66GHz Core 2 to 3GHz by increasing the FSB speed from its stock 1,066MHz to 1,200MHz.

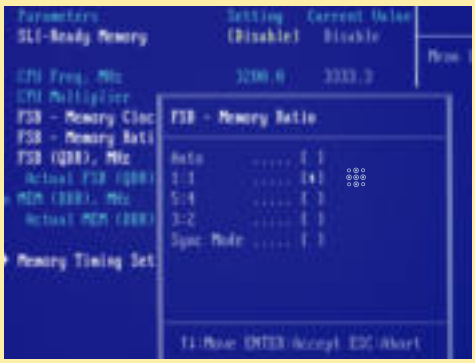
STEP 4

ADD SOME VOLTAGE

We wanted to go beyond the 3GHz we achieved, but our attempts at pushing the FSB further made our system unstable. There's still hope for more speed if we increase our CPU's voltage. In our BIOS's Advanced Chipset Features, System Voltages screen, we can increase the CPU voltage, the chipset voltage, and the memory voltage, in addition to the voltage of a few other parts. By pushing the CPU voltage of our early-rev 2.66GHz Core 2 Extreme QX6700 from 1.11 volts to 1.39 volts, we're able to push the FSB up to 1,333MHz and achieve a stable 3.2GHz CPU speed. How much voltage is safe? It's difficult to say, as the number differs among CPUs and motherboards. We recommend that you troll forums and overclocking databases to see how far people are going with individual chips. We can't give general recommendations on voltage as each CPU has different specs and anything over stock could nuke your chip.

STEP 5

TO OVERCLOCK RAM OR NOT?



So you're satisfied that the CPU is running far above its rated speed, but now you want to overclock the RAM. As we noted above, our nForce 680i board offers the option to run the RAM linked or unlinked. Linking the RAM sets the RAM speed as a ratio of the front-side bus's clocked speed. The ratios are determined by the chipset, and in our case, we could choose between FSB: memclock ratios of 1:1, 5:4, 3:2 or Sync mode, which is fractionally equivalent to running at a 2:1 ratio. Picking any of the settings will change the RAM speed. For example, if you push your FSB to 1,066MHz and choose a 1:1 ratio, your RAM speed will hit 1,066MHz—if you're using overclockable memory (see RAM section on page 24). If you're not using overclockable RAM, your box will probably just hard lock. A 5:4 ratio would give you 853MHz, 3:2 generates 711MHz, and Sync gives you 533MHz. Which is better? Some overclockers report that linked RAM gives better performance than unlinked. But you'll have to test your system by running apps you typically use to determine which setting is the most stable and provides the best performance for your needs.

STEP 6

BEEP! BEEP!

No, your system isn't asking you where the Dagobah system is. That constant beeping means your overclock failed. With some motherboards, simply powering down by unplugging the system from the wall or switching off the PSU for a few seconds will get you back into the BIOS. In some cases, you'll need to reset the system's CMOS by cutting power and then throwing the CMOS-clear jumper or removing and then reinserting the coin-cell battery.

STEP 7

TEST IT

Just because you booted into the OS doesn't put you in the clear. You should now stress-test the system using Prime95 or another application that really stresses the CPU. You might be tempted to use 3DMark06, but it's primarily a GPU test, and many overclocked systems that pass 3DMark06 burn-ins will actually fail under heavy CPU loads.

OVERCLOCKING RESULTS FOR OTHER INTEL CPUS

CPU / CORE	STOCK SPEED	OVERCLOCKED SPEED	VOLTAGE / FSB X MULTIPLIER	REV / STEP
CORE 2 QUAD Q6700 / KENTSFIELD	2.66GHz	3.44GHz	1.40 / 343 x 10	B / G0
CORE 2 DUO E6300 / CONROE	1.86GHz	2.88GHz	1.50 / 412 x 7	F / B1
CORE 2 DUO E4500 / ALLENDALE	2.20GHz	3.30GHz	1.40 / 300 x 11	D / M0
PENTIUM E2160 / ALLENDALE	1.80GHz	3.37GHz	1.56 / 375 x 9	2 / L2

Performed on an EVGA 680i SLI mobo, 2GB Corsair Dominator 8500 RAM, a PC Power and Cooling 1KW PSU, and standard air cooling.

OVERCLOCKING AMD

While we wait for AMD to launch its new high-end part, we can push its low- and midrange procs, such as the Athlon 64 X2 6000+ we use here, to new heights

BACK UP YOUR DATA

Overclocking is inherently risky, so back up your data. We mean it.

ENTER YOUR BIOS

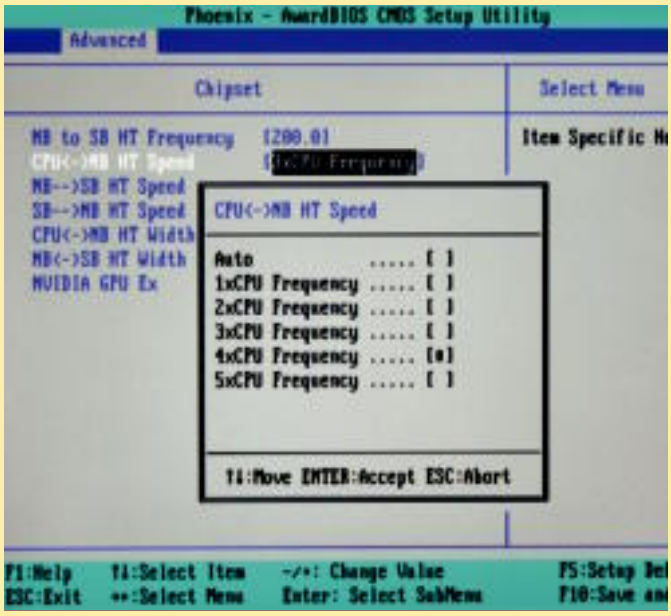
Get into your BIOS by hitting the Del, F1, or F2 key during boot. The key will vary by motherboard, so check your documentation if you're not sure what to press. Once in the BIOS, you will need to find the appropriate configuration screens for overclocking. The screens we refer to in our examples are specific to the Asus M2N32-SLI motherboard, but they will differ from BIOS to BIOS. Your mobo manual or an online search can provide guidance, but often you just need to dig around.

INCREASE YOUR CPU'S MULTIPLIER

Your choices for overclocking are determined by your proc. AMD's FX-grade CPUs, like Intel's Extreme chips, are unlocked and let you alter their multiplier settings. AMD recently began unlocking its Black Edition procs as a concession to overclockers who have stuck with the platform. Increasing the multiplier makes for a no muss, no fuss overclock. On our Asus M2N32-SLI board, we go into Advanced JumperFree Configuration and find CPU Multiplier. Our Athlon 64 X2 6000+ is locked, and thus can't exceed its stock setting of 15x. If your chip is unlocked, you can select a higher multiplier. To get an Athlon 64 FX-60 from 2.6GHz to 2.8GHz, you would need to increase the multiplier from 13x to 14x. Next, test your system for stability. If it crashes or won't boot, see Step 8.

MEET THE HYPERTRANSPORT LINK

There's an overclocking alternative to altering a chip's multiplier setting. If this were an Intel platform, we'd turn our efforts to the front-side bus and be instantly overclocking, but AMD's design is a little more complicated. You'll need to futz with the HyperTransport (HT) speed before you overclock. This interface between the CPU and chipset buzzes along at about 1GHz and doesn't like to get too far out of spec. Often, people who overclock without reducing the HT speed confuse HT instability with CPU instability. To lower the HT link on our M2N32-SLI board, we go into the BIOS and drill down through the Advanced and Chipset menus. There we see a setting for CPU<->NB HT Speed. Our choices are 1 through 5 and Auto. The default is 5x 200, or 1,000MHz. Since this value will increase during the overclock, knocking it back to 4x (800MHz) or even 3x (600MHz) shouldn't hurt performance. Keep in mind that when you overclock the CPU frequency, you overclock the HT as well. If, for example, you overclock your CPU frequency to 220MHz and are running a 4x multiplier on your HyperTransport link, you'll actually be running an 880MHz HT. Set it at a lower speed and prepare to overclock.



STEP 5

BOOST YOUR FREQUENCIES

Now it's time to overclock that sucker. On our M2N32-SLI board, we go to Advanced, JumperFree Configuration, and open CPU Frequency. There, we're greeted by settings of 200MHz and up. We can bump the frequency up to 210MHz, which when multiplied by 15x (the CPU's multiplier setting), gives us an overall speed of 3.1GHz. Another bump up to 220MHz gives us 3.3GHz. We recommend you increase speeds by 10MHz increments, testing for stability after each jump. If your machine crashes or fails to reboot, see Step 8.

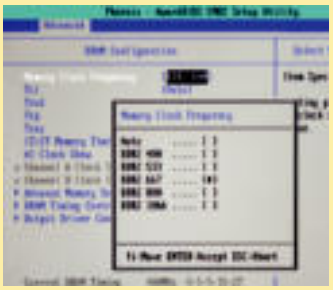
STEP 6

ADD VOLTAGE

In some cases, boosting the voltage to your CPU can help stabilize an overclock that's crashing. Unfortunately, this is one of the more dangerous aspects of CPU overclocking as overvolting a chip could kill it. On our M2N32-SLI board, we went into Advanced, JumperFree Configuration and changed the CPU voltage from Auto to 1.5 volts. That's about a tenth of a volt out of spec, but unfortunately for us, it didn't help us sustain a 3.3GHz clock speed, so we're stuck at 3.28GHz.

STEP 7

RAM DIVISORS



With AMD CPUs, the RAM is linked to the clock setting, and the Athlon 64's on-die memory controller supports only whole numbers for memory divisors. So a 3GHz Athlon 64 X2 6000+ can use either a 7 or 8 divisor to generate a signal for the RAM. Unfortunately, 3,000 divided by 7 works out to DDR2/857 and 3,000 divided by 8 works out to DDR2/750. AMD errs on the side of caution, so this processor actually runs the DDR2/800 at 750MHz. But when you overclock, you may inadvertently overclock the RAM further than you suspect. The 3.28GHz we achieved on our M2N32-SLI board, for example, runs the DDR2/800 slightly out of spec at 825MHz. That's not something to worry about, but if you're running your chip at much higher speeds than us, you'll need to make sure the RAM isn't running beyond what its maker guarantees. To do that, go into Advanced, CPU Configuration, DRAM configuration, and then Memory Clock Frequency. You should select a conservative low speed for now and clock it up after you've reached the CPU's highest speed.

STEP 8

IT WON'T BOOT

Don't be bummed if your machine hard-locks—it's the only way you'll learn your CPU's limits. To get out of the hole, shut off the PSU or pull the plug from the wall for five seconds. Plug it back in and power up the box. Some boards will automatically recover from a bad overclock and let you go back into the BIOS to aim a little lower. If this doesn't work, you'll have to power down again, unplug the PSU, and reset the CMOS via a jumper or button, or by pulling and reinserting the coin-cell battery. After five seconds, try booting it again—you should be able to access the BIOS.

STEP 9

TEST IT

Getting into the OS is about 65 percent of the challenge. You'll now need to test the machine by pushing the CPU with an intensive workload. We don't recommend gaming as a test since games are typically GPU-bound. Try a video encode or run Prime95. And if you have a multi- or dual-core processor, run a multithreaded app.

OVERCLOCKING RESULTS FOR OTHER AMD CPUS

CPU / CORE	STOCK SPEED	OVERCLOCKED SPEED	VOLTAGE / FSB X MULTIPLIER	REV /STEP
ATHLON 64 X2 6400+ / WINDSOR	3.2GHz	3.43GHz	1.50 / 214 x 16	3 / JH-F3
ATHLON 64 X2 6000+ / WINDSOR	3.0GHz	3.29GHz	1.525 / 218 x 15	3 / JH-F3
ATHLON 64 X2 4200+ / BRISBANE	2.2GHz	2.73GHz	1.524 / 249 x 11	1 / BH-G1
ATHLON 64 X2 BE-2350+ / BRISBANE	2.1GHz	2.61GHz	1.55 / 249 x 10.5	1 / BH-G1

Performed on an Asus M2N32-SLI mobo, 2GB Corsair Dominator 8500 RAM, a PC Power and Cooling 1KW PSU, and standard air cooling.

KEEPING YOUR CPU COOL

Without adequate cooling, your overclocked rig is as good as toast

It's hard to get much worse than a stock air cooler for your CPU. That's not to say there's anything outright *wrong* with the fan/heatsink combo that comes with a new CPU—the little guy will likely keep your stock-clocked processor running well within safe operating temperatures.

The minute you start overclocking your processor, however, you'll be jacking up your thermals to levels a stock cooler can't handle. Granted, when overclocking, temps will go up with even premium air coolers, but a solid aftermarket device will give you more room to work with. Your initial temperatures will be lower, and they won't rise as quickly as they would with a stock solution.

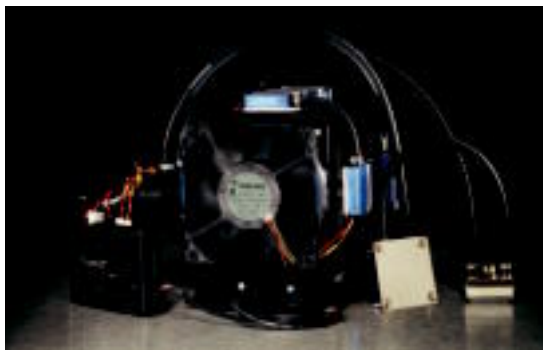
Our current Lab champion, Zalman's CNPS9700 ($80, **www.zalmanusa.com**), has maintained the throne for nearly a year. It uses a copper and aluminum framework to absorb the warmth produced by both Intel and AMD CPUs. The cooler's 2,800rpm fan emits a tornado-like *whoosh* when it's cranked to the max, but it also allows the device to reach epic levels of heat reduction. In fact, we now use the Zalman as a benchmark for other coolers. On the last test we ran, the device took our processor down to 37.5 C during our CPU burn-in test and 22.5 C when idle—a savings of 16.5 C and 9.5 C, respectively, over stock.

While other air coolers have matched the CNPS9700's effectiveness, none has done so in this small a package.

Aftermarket air cooling is a fine way to manage CPU temperatures, but only to a point. Eventually, practicality and performance concerns render air coolers insufficient for OC'd machines. That's why there's liquid cooling. Not only can you reach lower temperatures when using a liquid-based setup as opposed to air, but you'll also benefit from a lower sound profile.

Of course, there's an obvious caveat: Liquids plus electronics can equal a serious monetary hit if you have to replace hardware that inadvertently gets wet. Installing a water-cooling kit in your rig is a delicate process, and the drama only increases if you've never done it before. Sure, you can go with a preassembled liquid-cooling kit, but in our experience, a majority of these units perform on par with—if not worse than—stock air coolers.

The best liquid cooler we've found is CoolIT's Boreas unit ($450, **www.coolitsystems.com**). A fancier, fatter version of the company's Eliminator, the Boreas uses 12 thermoelectric modules to rip the heat from your molten tubing into a giant heatsink. Two 12cm fans take care of the rest, allowing the Boreas to beat our FX-60 test bed's stock cooler by 20 C in idle and 32 C during our burn-in test.



Hardcore cooling devices, like this CoolIt Boreas, come with a price—they require you to stuff more and more gear into your case.

DO RAM COOLERS HELP OVERCLOCKERS?

Plenty of folks have taken overclockable RAM to its limits without the aid of aftermarket cooling devices, so why buy one? RAM coolers help, but not in the direct and immediate way a better CPU heatsink does. Overclocked RAM is pushed way beyond standard voltage. For example, a DDR2/1250 module from Corsair is spec'd to run at 2.4 volts—a far cry from a standard 1.8-volt DDR2 part. With the extra voltage comes additional heat generation and a potentially shortened life. Adding a RAM cooler or simply increasing the airflow in your case (especially if the modules sit above hot graphics cards) can only help extend your RAM's life. MPC

Make Vista Liveable

We can't make Vista perfect, but our guide to tweaking the OS will certainly make it much more tolerable

BY CHRISTOPHER NULL

We're a year into Vista's reign of terror, and by now most average users have resigned themselves to the fact that they're stuck with Microsoft's bloated, pokey, buggy OS. People simply feel powerless to fight the software juggernaut and PC vendors that happily play along by preloading Vista on everything that goes out the door.

Well, you're better than that—you don't have to take this nonsense lying down. Vista may never run as smoothly as good ol' XP, but we've compiled an extensive collection of tips that will help you improve the OS considerably. We'll show you how to enhance performance, ease frustrations, and turn Vista's eye candy into something that at least does you some good.

No, Vista still won't be perfect when you're done, so we've got a special treat in store for you if, after you've finished reading our tips, you still aren't satisfied. Flip to page 48 and you'll find complete instructions for downgrading to XP or setting up a dual-boot machine with both XP and Vista. See? Happy days are here again!

Throttle User Account Control

Spare yourself the headache of endless pop-ups

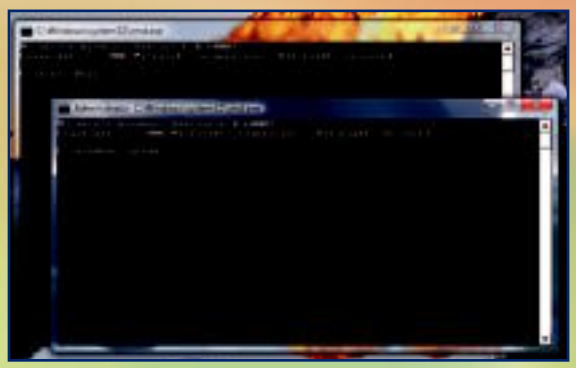
You won't get far in Vista before you start losing hair thanks to UAC, Vista's overbearing security pop-up system. If you're an even remotely sophisticated user, turning off UAC should be job one. It's easy to do: Visit the User Accounts control panel and click "Turn User Account Control on or off," then uncheck the box on the following screen. If you just want a little more control over UAC (without turning it off altogether), download TweakUAC (**www.tweak-uac.com**), which suppresses UAC messages whenever you're logged in as an administrator.

End warning pop-ups for good with a simple click.

Run Vista Command Line as Admin

Don't let the OS limit command-line rights

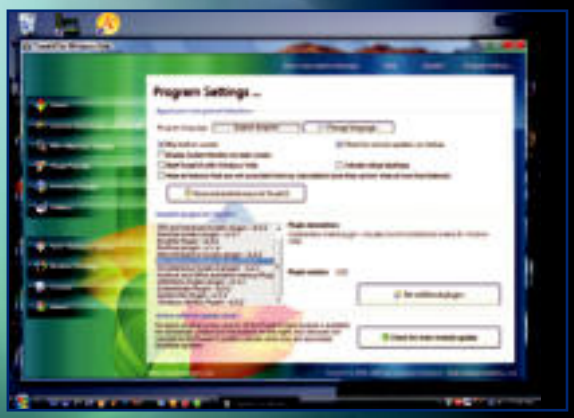
Typing `cmd` in the Start menu's search box will bring up the familiar command-line window, but depending on your machine's configuration, you might be stuck in a restricted mode even if you're logged in as an administrator. To launch an unrestricted Admin command line, type `cmd` at Start, then press Ctrl-Shift-Enter. You can also do this by right-clicking the CMD.exe result in the search box and selecting Run as Administrator in the drop-down menu. You'll notice you're in Admin mode by the Administrator prefix in the window's title bar. Now you can move and copy files and folders from the command line and run system tools such as msconfig; by default these privileges are locked out.



Two extra button-clicks let you run command line unrestricted.

Refine the Registry with TweakVI

Give your PC a modest speed boost



Additional TweakVI fixes let you optimize IE, Firefox, and even font smoothing.

Look, we know you've been promised repeatedly that if you just tweak *this one* registry entry, your computer will never crash and it'll run three times faster. And then you did it and nothing happened, right?

TweakVI, a downloadable application designed to fine-tune Windows registry settings, won't turn a Celeron into a Core 2 Quad, but in our tests it did modestly improve general benchmark performance, in the range of 5 to 10 percent. Download and install the free version of the app from **http://tinyurl.com/24yz6q**. When you run it, you'll want to focus your energy on the System Information and Tweaks section, then the CPU Tweaks... subsection under that.

Don't expect miracles, but try running your usual benchmarks before and after installing TweakVI—you might be surprised. That said, a $50 yearly subscription to unlock all of TweakVI's features is pretty much out of line; the free version should provide most everything you need.

Fix Vista Networking

Get PCs talking seamlessly

In the name of security, Vista wholly revamps the way networking operates. The Network and Sharing Center (part of the Control Panel) can be daunting and confusing when you want to share files on your local network. Here's the easy way to get the job done.

First, make sure you use the same workgroup name on all PCs. In Vista, this setting is in the System control panel. Click Change Settings on the main page to join another workgroup.

Second, you'll have a far easier time if you use the same username and password on all PCs you want to network. In Vista, you set up users in the User Accounts control panel. Administrator rights make this considerably easier, though it's officially discouraged.

Now you're ready to set preferences in the Network and Sharing Center control panel. Here's how it should look:

• **Network discovery: On** This makes your PC visible on the network.

• **File sharing: On** The equivalent of installing File and Printer Sharing on XP. You need it to do anything.

• **Public folder sharing: Up to you** The Public folder is a special folder Vista creates in which you can put data you know you want to share across the network with multiple users. You might store your pictures, videos, and music here, for example. It's just like any other folder, except it can be simply managed and shared with one click here. Turn it on (either read only or read/write) and you'll see the Public folder in the Computer view directly under the Desktop folder.

• **Printer sharing: Up to you** Only if you want to print across the network.

• **Password protected sharing: On** This is the setting that lets users with a valid login on the Vista PC reach shared folders on that computer. Turn password-protected sharing off and users can do just about anything. Leave it on for better security.

• **Media sharing: On** This is largely useless, unless you stream music to your Xbox or another UPnP device, but leave it on, why not?

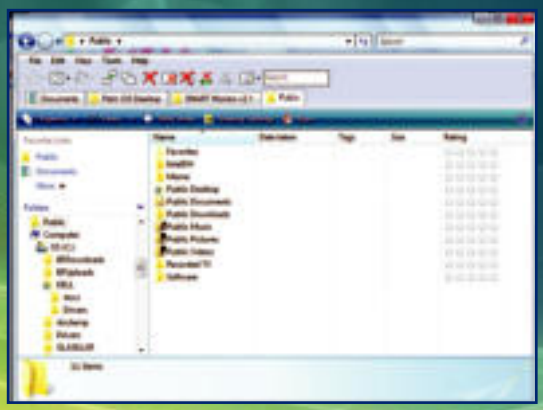
When finished configuring the Network and Sharing Center, your interface should look about like this.

Your last step is to select and share folders. This process is much like it is in XP. Just right-click any folder and select Share. If you followed the above instructions, you can accept the defaults at the following menu: "Share to your username only and with owner rights assigned." Click Share again to seal the deal!

Add Tabs to Explorer

Browse multiple folders in a single window

Your web browser has tabbed browsing, so why not your file browser, too? Add tabbed browsing to Explorer with the free QT TabBar (**http://tinyurl.com/2r9yj8**). Download, extract, and install (right-click to run as administrator), log off and on again, then hop into Explorer. Right-click the menu bar and add both QT TabBar and QT Tab Standard Buttons to the display. Tabs work much like they do in Firefox, with some new tricks available: Dragging a file from one window to another tab in order to move it to another folder is an especially nifty convenience.



Tabbed file browsing puts an end to cascading Explorer windows.

Essential Hotfixes

Make Vista crash and burn less often

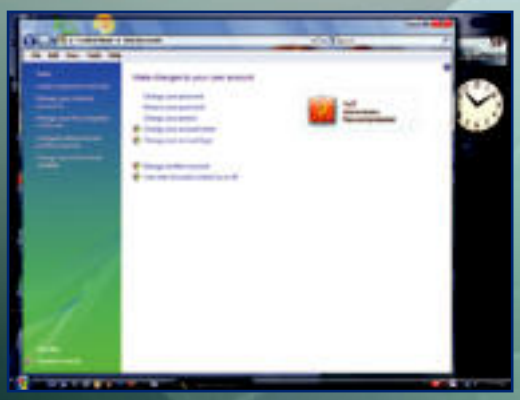
Don't just twiddle your thumbs waiting for Service Pack 1 to arrive. Take matters into your own hands: One or more of these fixes may solve problems you've been having with Vista. None of the fixes has been publicly announced or delivered via Windows Update, so you'll have to install them manually.

- **http://support.microsoft.com/kb/929451**: A Vista machine may register old IP addresses if certain changes are made to the networking setup.
- **http://support.microsoft.com/kb/931671**: Errors may occur when trying to put your PC to sleep with a live PPP connection.
- **http://support.microsoft.com/kb/932649**: Poor video quality in interlaced mode.
- **http://support.microsoft.com/kb/940646**: Slow performance with 3G WWAN connections.
- **http://support.microsoft.com/kb/941542**: Connecting to a network printer may fail.

As well, all users will benefit from a couple of general Vista performance and reliability hotfixes that have been pushed out through Windows Update (as recommended updates) and can provide dramatic improvements on some PCs. Check in the Installed Updates section in the Programs and Features control panel to make sure they are installed (look for the KB numbers in the URL). If they aren't already installed, install them manually.

- **http://support.microsoft.com/kb/938194**
- **http://support.microsoft.com/kb/938979**

You can also find additional early fixes, including a prototype of Vista SP1, at **www.thehotfix.net**.



Keep an eye out for additional hotfixes released since this article went to press at http://aaron-kelley.net/downloads/hotfix/.

Upgrade the Sidebar

Turn Vista's eye candy into a useful tool

Sure, you thrill at the sight of the weather report and that analog clock, but how about putting some genuinely useful apps into the Vista Sidebar? Here are a few power-user favorites:

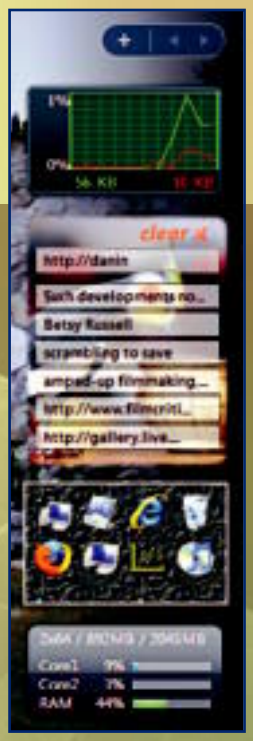
App Launcher (**http://tinyurl.com/39pe2n**): It's just like the Quick Launch toolbar, but considerably more manageable.

ClipboardManager (**http://tinyurl.com/22g4t4**): Gives you quick and easy access to current and recent clipboard contents.

Memory Meter (**http://tinyurl.com/2sgc86**): A simple look at how full the ol' DIMMs are and how well your CPU cores are clocking along.

Mini Outlook Inbox (**http://tinyurl.com/3yhm8y**): Outlook junkies can keep tabs on their inboxes without clogging up the screen.

Network Utilization (**http://tinyurl.com/29k5j2**): Keep an eye on your bandwidth with this simple graphical display.



A selection of intelligent upgrades turns the Sidebar from eye candy into brain candy.

Delay Vista Activation for a Year

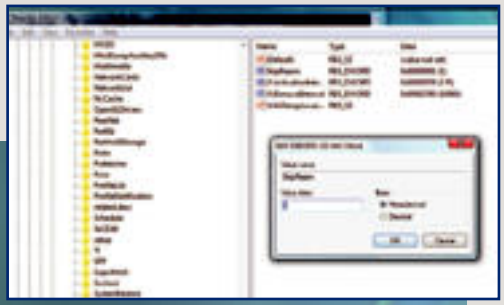
That's 25 fewer characters you have to type

When you install Vista, you don't actually need to input a license key. Vista will give you 30 days before requiring the key before throttling down to Restricted mode. But you can extend that eight times with this simple fix, allowing you to make major hardware upgrades without having to reactivate the OS.

To reset the timer to 30 days, open a command-line window in Administrative mode (see tip on page 40), then type `slmgr -rearm`. This starts the 30-day countdown anew, no matter how much time is left on your first countdown. You can do this three times (for 120 days total) before it won't work any more.

You can give yourself another 240 days by making one registry tweak. Type `regedit` in the Start menu search box and press Enter; then navigate to HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\SL. In the right pane, right-click SkipRearm and click Modify. Change the 0 to a 1. You should now be able to do the rearm trick above eight more times.

Note: We make no promises that Microsoft won't patch this behavior before day 360 rolls around.



This simple registry hack will give you a year of no-license-key operation.

Fix Nvidia-Specific Performance

Upgrade your GeForce gaming

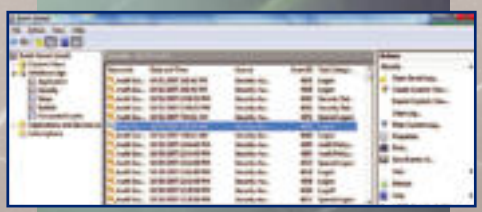
Running an Nvidia GeForce 6, 7, or 8 series videocard? If you're seeing abnormally low frame rates or system crashing while gaming (especially noticeable in Battlefield 2142, Half-Life 2, and Rainbow Six Vegas, among other titles), a patch can help considerably. Grab it here: **http://support.microsoft.com/kb/940105**. A similar fix is available for Vista users running SLI rigs at **http://support.microsoft.com/kb/936710**. This hotfix improves (or enables) the use of a secondary graphics card under DirectX 10.

Gaming under Vista might choke with late-model GeForce cards, but a quick download can fix you.

Keep Tabs on Vista Via Email

Get instant alerts when something's amiss

Rather than manually checking the boring old Event Viewer, how about getting Vista to email you when something's gone wrong? To set up email logging, open the Event Viewer (it's in the Administrative Tools control panel), open a log, and find an event for which you want to be notified. In the pane on the right, click "Attach Task to This Event..." and walk through the wizard, specifying the server from which email should be sent and the address it should go to. (Be careful with this, you might end up spamming yourself.)



The security log is likely the most useful source for logging via email.

Boost SATA Drive Performance

Enable SATA's latest high-test features

Risk-takers can get a little hard drive performance boost by turning on two options in Vista that are disabled by default. In Device Manager, find your hard drive (under Disk Drives), right-click it, click Properties, then click the Policies tab. Select "Optimize for performance" and check both "Enable write caching on the disk" and "Enable advanced performance." Be warned: With the latter two options turned on, you may risk losing data if you lose power or have a catastrophic crash, so make sure you use a universal power supply and run regular backups. The specific performance boost depends on the make and model of your drive; don't expect the moon.

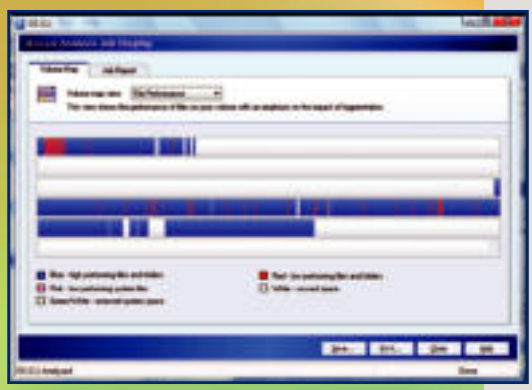
Vista doesn't automatically take advantage of some of SATA's performance features.

Kick Vista Defrag to the Curb

Upgrade your defragger to something less useless

Vista's disk defragmenter is a giant leap backwards. Run a defrag manually and what you get isn't the helpful, animated progress window you know from XP, but rather that evil, spinning, blue wheel and the notice "Defragmenting hard disks... This may take from a few minutes to a few hours." Wow, informative!

To get a better defrag system, you'll have to install third-party software. Without a doubt, the best is Diskeeper 2008 Pro Premier (**$100, www.diskeeper.com**), which offers an exhaustive collection of defragging options, including file sequencing based on usage patterns, boot-time defragging, and barely noticeable background operation. The $50 Pro (non-Premier) edition is exactly the same, sans the file-sequencing feature.



Reclaim the visual look at your hard drive's fragmentation with Diskeeper.

Downgrade to WinXP

Head back to what actually works

You saw this one coming. After all that work, you may very well find that Vista still isn't your cup of tea and you'd like to go back to Windows XP. We don't blame you; we pretty much feel the same way.

If push comes to shove, here's how to return to XP.

1. Sadly, you can't just pop in an XP disc while you're running Vista and hit Install. Your first step is to determine whether you want to dual boot Vista or simply wipe out Vista and replace it with XP. If you're going to dual boot, use the DiskPart tool on the Vista installation disc (details here: **http://tinyurl.com/fyzmf**) to create a second partition, or use a third-party tool such as GParted (**http://gparted.sourceforge.net/**) to do the same thing. If you're wiping out Vista, you can use the same tools to erase the Vista partition and start with a clean slate or just reformat while booting and installing from the XP setup disc.

2. If you're using a bleeding-edge PC, XP will likely choke when it comes time to start copying files, as it won't be able to see your hard drive. Why? XP can't handle AHCI mode on SATA drives, which most newer PCs have enabled. In your PC's BIOS, turn off AHCI mode (which should turn on ATA emulation) to make your installation easier. Or just load the drivers via floppy F6 drivers at boot. Alternately, you can slipstream AHCI drivers into a Windows XP installation disc, but this is a huge hassle.

Your final step in setting up a dual-booting Vista/XP machine with EasyBCD should look like this.

3. With a blank partition ready and AHCI turned off, boot from an XP setup disc, preferably one with Service Pack 2 preloaded on it. Install the operating system normally. (If dual booting, Vista will remain on the C: drive; XP will show up on E: or another drive letter. The two OSes will be able to see each other, so be cautious when selecting the proper drive when installing apps.)

4. If you plan to dual boot, you'll need to repair the Master Boot Record, as XP overwrites the Vista-created MBR, which prevents Vista from loading. To fix it, boot from a Vista DVD and select "Repair your computer" on the Install Now screen. Select Startup Repair to finish the job.

5. Last step: Set up dual booting. Any boot manager will do the job, or try the free (and Vista-friendly) EasyBCD (**http://tinyurl.com/yovsxx**). Boot into Vista (you won't have a choice), install and run EasyBCD, then click Add/Remove Entries. Change the drive letter to E: (or whatever drive letter you set up in Step 3), and then change Type to Windows NT/2k/XP/2k3. Click Add Entry, then Save. Reboot and the bootloader will now automatically appear. MPC

THE GREAT CAS

Five unique designs shoot for a fabled 10/Kick Ass verdict. Some won't even come close!

BY DAVID MURPHY

PHOTOGRAPHY BY MARK MADEO

E RACE

When it comes to case design, innovation is a double-edged sword. If a company gets it right, it can win attention and accolades for introducing a fresh and functional approach to an otherwise stale and unchanging market. Let's face it, a lot of new cases look just like the plain ol' boxes of yore, with maybe a couple of new fan holes here and there.

But when a company tries too hard, or gets sloppy with the detail work, innovation can quickly turn an otherwise perfectly usable design into a configuration nightmare. We've seen this in droves. The thing is, case quality isn't always something you can eyeball. Sure, that case with the huge, nondescript fan on the crudely windowed side panel might look ugly as sin, but maybe the chassis brings something to the table that you wouldn't realize unless you built a system in it. Worse yet, what if that case with the awesome features you just picked up isn't an ideal fit for your system? What if your components don't fit at all?

This is exactly why the process of case selection can be one of the most important steps you take as a budding rig builder. And it's why we don't mess around when we review cases in the Maximum PC Lab. In this roundup, we're putting new designs from some of the top chassis creators to the ultimate test: We'll stuff a full, functioning machine into each enclosure, complete with some of the fastest (and hottest) parts a computer can handle. If a case can't play nicely with an enthusiast setup, it's not worth your time or money. Because why would you ever want to downgrade from your current enclosure to a more headache-inducing model? Find out which of these models made the grade.

NZXT Alpha

Grease me up, I'm going in!

If you're looking to build a screamin' SLI or CrossFire rig, you'll have better luck using the box this case comes in.

There are apparently two versions of the English language going around the technological world: One is the version manufacturers use when they say things like, "The NZXT Alpha also enables the user to fit large expansion cards like the Nvidia 8800 GTX." The other version is the kind we use, where the word "fit" doesn't suggest a large bucket of grease, a hammer, and profanity that would make a longshoreman blush.

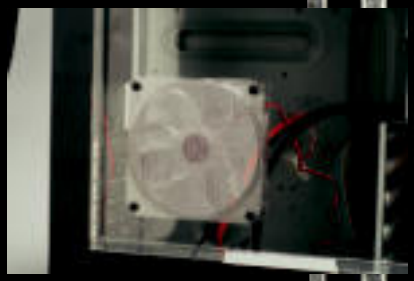
The smallish size of the NZXT midtower case was obvious the minute we cracked the box, but we figured that installing a decent-powered gaming rig into the chassis wouldn't be a total bust. And it wasn't; it was just a hassle. The PCI holders aren't your average combination of a screw and a metal tab. No, these holders have multiple notches and tabs that are meant to lock into the slots—obviously designed so the holder doesn't accidentally fall out of your case. You know, when it's not attached with a screw.

In actuality, you'll likely break one or more of the tabs when you try to remove the flimsy metal holders from the Alpha. It's a small concern if you never plan to build a second machine in this case or switch any PCI cards around. But that's just silly talk. Nobody likes a gaping hole in the rear of their case, but that's what you'll end up with if you start futzing around with your PCI-based devices.

Of course, the Alpha has an ingenious solution for this problem: It just doesn't make any room for large PCI devices like today's high-end videocards. If you try to put an 8800 GTX into the case straight on, it's not going to happen. The videocard slams right into the case's hard drive bay. It's possible to get the card in there if you hit on the perfect combination of patience, deft angling, and brute force, but why bother? Once the hellish task is complete, you've got your card wedged in so tight that there's no more than a fraction of an inch between the end of the card and the drive bays, and you still have to attach cables!

A strange benefit of the case's miniature size is that airflow, for all intents and purposes, is perfect. The fresh breeze produced by the case's two 12cm fans covers your motherboard just as well as it covers your videocard and hard drives. So feel free to pack your rig full of hot equipment—but not large graphics cards. The NZXT Alpha is, at best, an above-average case with a deal-breaking flaw.

Have fun wedging an Nvidia 8800 next to this neighboring drive bay!



The blue LED fan on the Alpha's window adds some lovely coloration to the chassis.

You can purchase an Alpha with or without the side window; we recommend the former.

NZXT ALPHA **5**

$60, www.nzxt.com

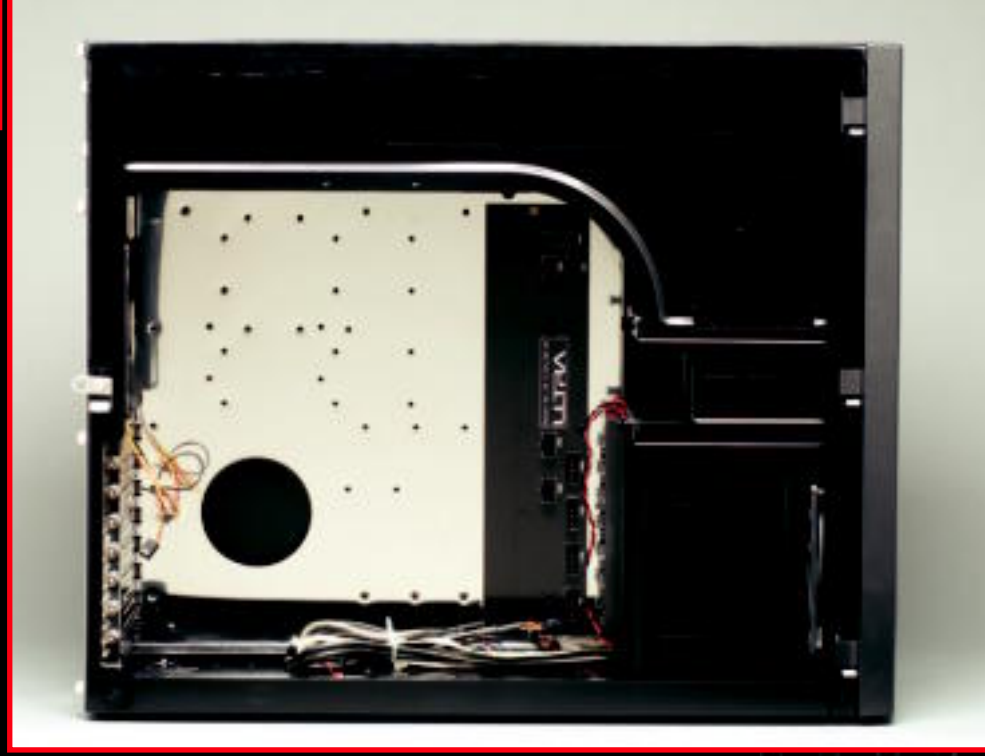
Ultra m998

A case that leaves you guessing

Ultra's m998 is a sad combination of two phrases: "Looks are deceiving." and "A for effort." Funny, because when we consider the case strictly on face value, it's anything but a cliché. For starters, the m998 is wider than the standard cases we've tested, but the aluminum body keeps the enclosure rather light.

Opening up the windowed side panel of the m998 is like throwing open the doors to Willy Wonka's Chocolate Factory. There aren't any lake-drinking chubby kids or Oompa-Loompas, but a number of new delights await curious rig-builders. The first thing we noticed was the motherboard tray. We like the neat look of its reflective surface—too bad there aren't any labels for the motherboard standoffs. That's misstep number one for Ultra.

The second thing we noticed was a fanciful panel studded with Molex connectors running vertical to the motherboard tray. We assumed this was a new power strip of some sort, as lord knows the manual told us absolutely nothing about the unfamiliar feature. Only after happening upon the information on Ultra's website did we realize that the top portion of the so-called Ultra Power Bar is for inputs—your various power supply cables—while the bottom of the bar is populated with outputs—from which Ultra's short, uniform cables extend to your peripherals. As for which input corresponds with which output… well, that's an awesome game of trial and error.



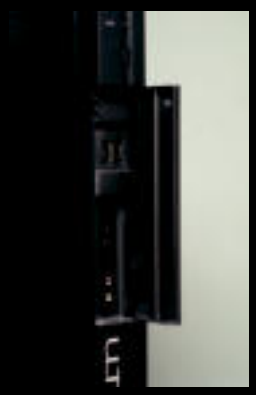
The m998's interior is all contours and class.

That said, the power bar is pretty sweet if you can figure it out. While it's not a one-stop shop for cable management, it does help relegate the unsightly snarl that typically occupies a case's interior to just the top half of the enclosure, keeping the bottom half neat and tidy. Trouble is, you'll have to negotiate that northern tangle of power supply cables to fit multiple devices into the 5.25-inch drive bays. Tread carefully, you water coolers.

Ultra's proprietary power bar limits cable clutter in the bottom half of your machine.

Less-adventurous builders will find that the m998 does little to ease their construction efforts. The chassis loves screws. It loves them so much that it doesn't give you a single screwless way to interact with your case. Nada. For the lax computer builder, that's a terribly weak move on Ultra's part. Speaking of lazy, the m998 comes with front-panel eSATA. It's just not plugged in. You have to pop a side panel and string your own SATA cable. That's certainly the first time we've ever done *that* with a case.

This is *Maximum PC*, not *Masochist PC*. We aren't happy when the build process is made needlessly tedious, be it through half-baked features or a dearth of instructions. The m998 would be a strong contender if a bit more attention were paid to the details.



Front-panel connectors are hidden ninja-style beneath a push-spring covering.

Such fancy innards deserve a window—too bad an unattractive fan duct and grate obstruct the view.

ULTRA M998

6

$200, www.ultraproducts.com

Cooler Master 690

Innovation: 1. Application: 0

In yet another example of a design that likely looked way better on paper than in practice, we find ourselves struggling to come to terms with the Cooler Master 690's more unique features. We can't fault the company for trying; in some ways, we applaud Cooler Master's attempts at distinguishing the 690 from the rest of its cadre in the crowded case market.

The exterior of the 690 not only looks cool, the mesh accents throughout the shell also serve as a handy means of moving air into and out of the case. Arguably, this semi-open design might diffuse air you want directed at certain key components, but the quasi see-through paneling—especially when illuminated by a few LED fans—looks slick enough to silence such concerns. Anyway, with room for up to seven 12cm fans, the 690 is hardly lacking when it comes to air-powered cooling potential.

Correction: six fans. When you mount a standard-size power supply to the bottom of the case, you lose one of the fan slots outright. We're baffled as to how Cooler Master thought that power supply cables and a 12cm fan could somehow coexist in the same physical location, but there you have it.

Speaking of cables, the 690 uses an interesting scheme for managing them. A series of plastic clips attached to the motherboard tray encourages you to route all your cables along a single, uniform path. This is supposed to minimize cable clutter. And it does. But it also hampers your ability to connect devices to your motherboard; the clips and cables along the route blocked access to our floppy connector.

Whoops.

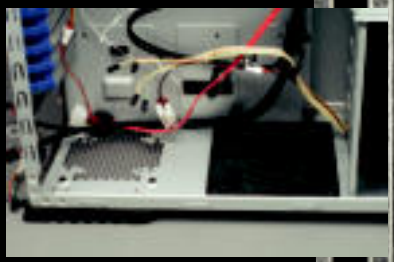
Yes, right now it's only a floppy connector, but the minute we encounter a motherboard whose side-mounted SATA ports are rendered useless by the 690's design, well, that's the minute we're tossing this case into the garbage. And it's not just the motherboard that presents an issue. We had a little trouble getting our optical drive to fit amidst the cords of the top-mounted USB, FireWire, and eSATA connectors.

While the case itself is screwless, you pay for this luxury with the hard drive holders. Rails on either side of hard drive holder let you scoot your drive right in—that is, after you've spent time wrestling your drive into the flimsy, plastic sheath.

Sweet ideas combined with subpar execution: Welcome to the Cooler Master 690.

For all the 690 chassis does to improve your rig's wiring, the end result is hardly helpful.

Storing screws in this manner is unique—too bad it doubles our work.



One hole is for the power supply fan; the other (in theory) fits a standard 12cm fan.

The beautiful grilled exterior of the 690 is but a pretty cover-up for the interior's flaws.

COOLER MASTER 690

$80, www.coolermaster.com

4

Thermaltake Xaser VI (VG4000)

Just don't drop it on your foot

The Xaser VI is huge. Absolutely huge. Remember: Lift from the knees.

For a change of pace, we'll start with our biggest critique first—literally, the biggest. Thermaltake's Xaser VI chassis (the air-cooling-specific VG4000 model) is the Godzilla of cases. It's heavy enough to make carrying it an awkward, hernia-inducing experience, and that's *before* you slap a system inside. Heaven forbid you make full use of the case's eight (?!) hard drive bays and seven (?!?!) 5.25-inch expansion slots. Add water cooling and you might want to invest in some wheels and a dolly for transporting the beast.

The Xaser VI is a screwdriver's worst enemy. Save for the motherboard standoffs and typical fastening screws, you shouldn't have to touch any kind of tool to assemble a basic rig in this chassis. In this respect, some parts of the case function far better than others. For instance, we love the mounting setup for the Xaser VI's 5.25-inch bays. Removing the front-panel coverings is a one-second process, and you simply shove your device in from there. It automatically locks into place, and that's it. No screws to tighten, no fasteners to fuss with.

The PCI holders attempt to follow suit, but they're a bit more delicate and frustrating than their peers. We broke the very first fastener when we gently tried to remove it from the side of the case. When you do this—and trust us, you will—you'll be forced to default to the old screw for locking your PCI card into place. It's an ugly solution that makes us wonder why Thermaltake didn't include some extra connectors in the accessory bag that comes with the Xaser VI.

The goody bag also lacks any extra thumbscrews for the exterior of the case. But in many ways, we wish Thermaltake would have eschewed these tiny screws altogether. The design of the case is such that the narrow thumbscrews you use for the panels are absurdly close to the case's decorative exterior elements. So something that should be removable with your fingers requires the use of a tool, thus defeating the entire point of their existence. It's a minor detail, but when 95 percent of a case is perfectly screwless, there's no reason you should have to find a tool kit to start (or finish) your work.

A top-loading storage bin and ample air-cooler support help fill out the list of excellent eccentricities on this fairly innovative chassis. The senselessness of the minor flaws make us hesitant to recommend the Xaser VI for general use, but there's no denying that this is one of the slickest full-tower cases we've tested. A few touch-ups on the drawing board would make this one rockin' enclosure.

Gaudy or otherwise, Thermaltake knows how to run with a design theme.

An obscene number of front-panel connectors are hidden beneath a stylish push-top covering.

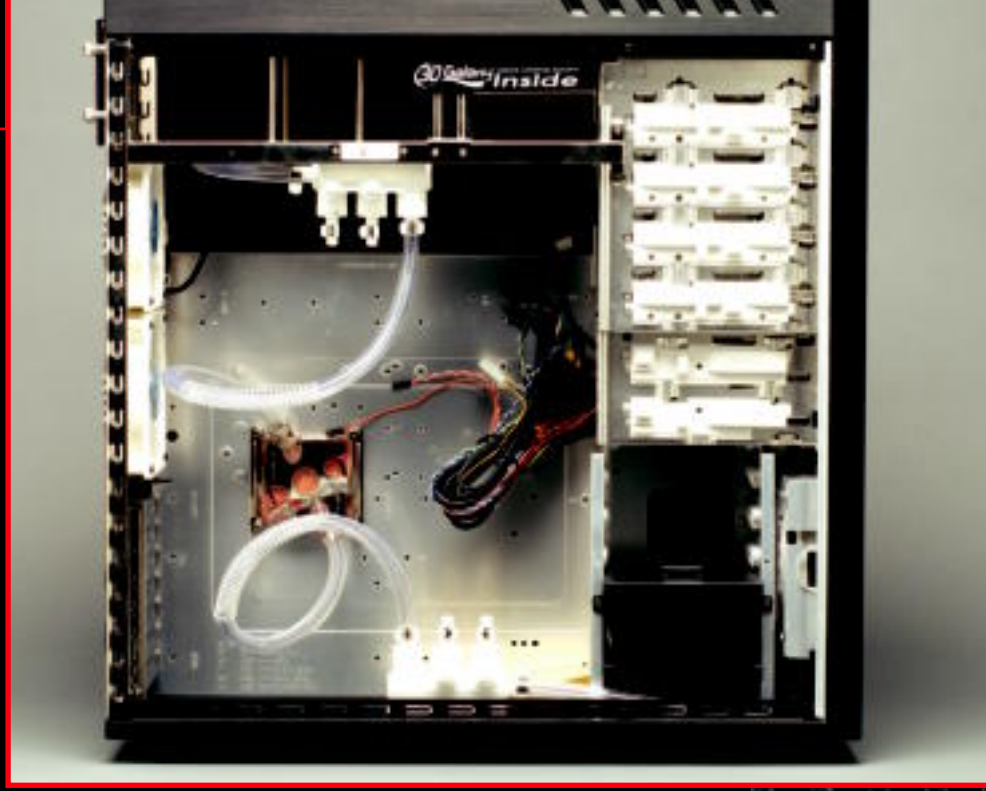
You can remove the drive bays on the bottom of the case and replace them with an included fan!

THERMALTAKE XASER VI **8**

$300, www.thermaltake.com

Gigabyte Mercury Pro

It comes with a what?



Both the 5.25-inch bay and PCI locking mechanisms are screwless, and they do an excellent job of holding your stuff in check.

In our last big case roundup (April 2007), Gigabyte's Aurora 570 earned top marks for its excellent design and convenience as a chassis. But Gigabyte certainly hasn't rested on its laurels since then—the company's designers have gone back to the drawing board and given us a case that rivals the coolness of its predecessor. Gigabyte calls it the Mercury Pro; we would have named it the Monstrosity Pro if we were in charge. That's because this case isn't just a run-of-the-mill chassis. It's a fully functional (armed and operational?) water-cooling/case hybrid. Take a moment if you need to collect yourself.

At least, that's how we felt in the presence of this case's greatness. Typically, when water cooling is involved, we expect high levels of frustration and/or fluid leaking all over our expensive gear. But to our extreme satisfaction, Gigabyte has turned an otherwise irritating process into utter simplicity. For example, the water block stays the same regardless of your computing platform. Just snap a bracket over the top of the block and you're good to go. It took us about one minute to switch from an Intel to an AMD setup—we spent far more time looking for the mounting bracket amidst the Gigabyte's many accessories than we spent clamping the block to our motherboard.

The cooling mechanism itself is Gigabyte's Galaxy II water-cooling system. Rather than slapping this system to the side of the chassis and calling it a day, Gigabyte went to great lengths to integrate the water-cooling kit into the chassis itself. Ugly tubing runs alongside the framework of the case as much as possible, and we can't speak highly enough about the six additional splitter valves Gigabyte includes in the case. They make for a stylish and handy way to add more cooling to your rig without having to disassemble the entire kit or, for that matter, spill even a drop of fluid.

Performance-wise, the cooler rivals some of the top all-in-one kits we've reviewed. It runs on a variable fan-speed dial, and we saw excellent performance on both its low and "cover your ears" setting. The cooler dropped our CPU to 40.5 C and 35.5 C, respectively, during full-burn testing, and 18 C and 15 C, respectively, when idle. Filling the system with fluid is as easy as holding a bottle over the case's blowhole—a front-panel flow meter and tiny reservoir window show you exactly what's pumping (and how much is left!).

Believe us, if we could find something about the Mercury Pro to criticize, we would. The Galaxy II does emit a horrible shrieking noise if it's underfilled, but really, that's it. This case rocks.

As always, Gigabyte gives you a choice between a windowed or grilled side panel.

Watch your liquid churn through the Mercury Pro's front panel.

Splitter valves at the top and bottom of the case offer plenty of room for expansion.

GIGABYTE MERCURY PRO **9**

$360, www.gigabyte.us

MAXIMUM PC KICKASS

CAN YOUR CASE DO THIS?

All this talk about innovation and unique features has us contemplating some special tricks that could endear us to an enclosure

USB MEGAHUB

Most cases offer two or three USB ports up front, but considering USB is—without question—the No. 1 tech invention of all time (see the December issue for more info) that's a level of scarcity we just can't abide. We want room for all our essentials, plus a USB disco light, mini fridge, AND air freshener, dammit!

Of course, a newfound surfeit of USB hoo ha leaves us with much less workspace. That's OK because we know of one device that could stand to be relocated. Our external drive would feel much more at home nestled in its own special nook. MPC

CASE FROD

Your components could be outdated, your wiring could be a shambles, your case could be sheltering a family of refugee dust bunnies. A faux-interior decal doesn't just get you off the hook for slovenliness, it has folks thinking you're the Martha Stewart of PC maintenance.

INTERNAL EXTERNAL DRIVE BAY

Surf the Web **Anonymously**

Don't want prying eyes to know you just joined a Celine Dion fansite? Here's how to cover your tracks and surf in privacy!

TIME 00:15 HOURS:MINUTES

WHAT YOU NEED

- INTERNET CONNECTION
- XEROBANK BROWSER
- PROXY IP ADDRESS

If you wish to conceal your identity in real life, you need only to shove a paper bag over your head and alter your voice. Voilà, instant anonymity! But it's not as easy to lurk in the shadows online—a savvy surfer can dig up all kinds of information about you, from your name and address to your social security number. And it doesn't take a sophisticated stalker to track you down; chances are, you've left behind a trail even a first-year Boy Scout could follow. But fear not, today you'll earn your anonymity merit badge from the Maximum PC Den, Pack 1337.

BY PAUL **LILLY**

1 Surf with an Anonymizer

In the online world, a web proxy acts as your Internet agent and requests information from websites on your behalf. The website in turn communicates with the proxy, which then passes the information back to you. Meanwhile, your IP address stays concealed and the website has no idea how to get in contact with you directly.

The easiest way to run with a proxy is through one of the many free websites offering anonymous web surfing. There's no setup involved, and they all run right from your browser. But be warned: This convenience comes at the expense of speed, and not all websites play nice with proxies. Plus, if you choose a proxy at random, you could fall prey to a site designed to steal your information, not protect it. All proxy sites carry this risk, but Proxify (free, **http://proxify.com/**) has a good reputation, and its registration information matches a Whois lookup, providing a level of reassurance.

Head over to Proxify and simply enter the web address of the site you want to view in the text box. Proxify also lets you select from three preconfigured options tailored toward maximum speed, security, or compatibility. If you think you can do better yourself, you can manually tweak the settings, opting to remove cookies, ads, scripts, and referrer information, or select any combination that best suits your surfing habits. You can verify that the proxy's working its cloaking mojo by visiting **www.whatismyipaddress.com** and making sure it's not broadcasting your real IP address.

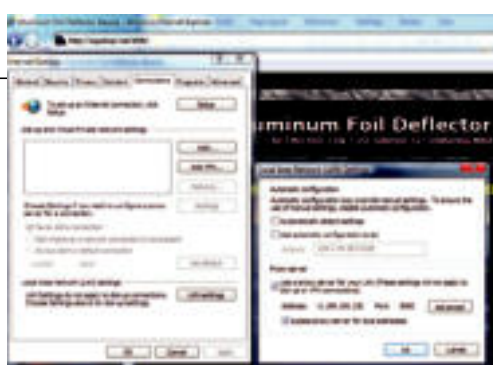
2 Manually Configure a Proxy

Using a free online anonymizer can be a boon when you want to surf stealthily without any setup hassles, but you sacrifice speed and functionality. Some services impose a steady stream of advertising, and almost all of them throttle your connection speed or refuse to work during peak usage. Subscriptions are available, but why pay a fee when you can manually configure your browser to hide your identity for free?

To get a list of available proxies, navigate to **http://tinyurl.com/p0pj**. Here, you can sort proxies by various criteria, but pay special attention to the IP details, which include information about HTTPS (SSL) support and uptime percentages. It's possible for a hacker to set up a proxy as a trap, so treat these IPs as anonymous connections—not secure ones on which you'd enter bank account or other personal information.

With the IP address and port in hand, Internet Explorer users should click Tools and select Internet Options. In the Connections tab, click the LAN settings button. Check both boxes under the Proxy server heading, input the IP address and port you just recorded, and save your settings.

If you're running Firefox, click Tools and select Options. Click the Advanced icon, select the Network tab, and click Settings. Highlight the Manual Proxy Configuration radio button and input the IP address and port. Before exiting, be sure to check the box that reads "Use this proxy server for all protocols."



Both Firefox and IE7 make it easy to configure your browser to use a proxy, but you may need to periodically change the IP address if the server goes offline.

3 Tunnel with Tor

We're going to throw more adept stalkers off our trail by traveling on the Tor network. Rather than going directly from point A to point B, page requests made over the Tor network are randomly tunneled through a series of nodes before reaching their final destination, making it difficult to track you. But concealing your trail is only the beginning. Your data packets are encrypted along the way, and each relay point only knows where the packets just came from, not where they originated from. Furthermore, each relay point receives a different encryption key, so your data remains secure up until the exit node. If you're worried someone might be snooping at the exit node, only use the Tor network for sites with end-to-end encryption, which start with https://.

To travel the Tor network, you must download a preconfigured browser. Formerly known as Torpark, the xB Browser (**http://xerobank.com/**) is built around Firefox 2.0 and requires no installation, which means you can also run it from your USB key. Just fire up the browser and start surfing. Because you're hopping from node to node all around the world, traversing the Tor network can be slow, so when you don't need anonymous access, click the onion icon to toggle it off.

With no installation routine, you can take xB Browser with you on your USB key and surf anonymously while on the go!

4 Use an Alias

No matter how secure you've configured your PC, anonymity goes straight out the window if you slap an identifiable ID badge across your online forehead, nullifying everything you did in the previous steps.

When registering for a message board or an anonymous email address, be more creative than jHall73FL. Right off the bat you've broadcast your last name, age, and state of residence and that your first name begins with the letter J. The only thing worse at this point would be to list your home phone and social security number in your profile. Instead, pick a nickname that's not personally identifiable to you. If you're a female looking to fly under the radar, make no indication of your sex. Choosing HottieGamerGrl is a surefire way to invite unwanted solicitations and encourage stalkers.

Use different nicks and emails for different sites too, making it difficult for snoops to track your online activity. If you use the same alias everywhere you go, Google will rat you out to anyone willing to listen. This may not seem like a big deal, but if you're posting on several message boards that would only be of interest to people living in a particular area, you're essentially giving out your location.

5 Cover Your Tracks

It's not just online stalkers you need to be worried about, but offline ones too. Now that you've secured your surfing habits, it's time to hone your browser housekeeping habits to keep nosy Nellies from spying on your online activity. Get in the habit of clearing your browser's cache and cookies. If you're running IE7, select Delete Browsing History from the Tools menu and click Delete All. In Firefox, click Tools, select Clear Private Data, and check each box. Firefox users can also install the Stealther extension (**http://tinyurl.com/2pr8zs**), giving you the option of disabling browsing history, cookies, and more. MPC

Ask the Doctor

Diagnosing and curing your PC problems

SHUT IT DOWN! SHUT IT ALL DOWN!

I had an Asus Striker Extreme and upgraded to 4GB of RAM and a C2D E6850 CPU. After this upgrade, my computer wouldn't shut down. I thought the problem might be with the motherboard, so I bought an Asus Maximus Special Edition. Well, the rig still does the same thing.

Every time I put 4GB of RAM into my computer, after about one hour of usage, it will either not install any programs or it will shut down. Since the activity light constantly blinks, it seems that the computer can't access the hard drive. I have to manually turn off the computer every time I'm done using it. If I just install 2GB of RAM, everything is OK.

—Sam Winotai

The Doctor believes that there are three possible problems: Potentially, the motherboard is allergic to the RAM you purchased. Each motherboard vendor specs certain modules to work in a board. In general, most two-DIMM systems will work fine even if you don't use RAM from the manufacturer's recommended list since two DIMMs is less of a load on the chipset. When you run four DIMMs, however, motherboards and chipsets can get a little more finicky, especially if the DIMMs are not matched.

The issue may also be related to how the board is reading the SPD chip on the modules that tell the BIOS how to configure the RAM. The Doctor has seen many problems related to performance memory that is not properly recognized by motherboards. You should go into your BIOS and manually set your memory timings to something a little more conservative. It's also quite possible that you have a bad DIMM. Test your RAM with memtest86+ (www.memtest.org); it should let you know if one of your sticks is going haywire.

CROSSFIRE BLUES

I recently built a new rig. It consists of an Asus P5K mobo, 2GB of Corsair RAM, an Intel Core 2 Quad Q6600, and two Nvidia 8600GT videocards. I remember checking for SLI compatibility, but I must have misread something! Unbeknownst to me, the P5K isn't SLI-ready, it's CrossFire-ready.

I spent the money on two graphics cards, not to mention the SLI connector, and am looking for a way to fix this. Unfortunately, I have no clue as to where the receipt is, so a return is unlikely. Is there any other way to solve this, short of buying a new motherboard?

—Kurt Colbourne

A CrossFire motherboard might look similar to an SLI mobo, but that ATI logo will crush your SLI-themed dreams.

The Doc has no cure for your ill, Kurt. AMD apparently helped HP develop a prescription for running two Radeon cards on an SLI motherboard, so there's probably a way to run two Nvidia cards on a CrossFire mobo, but neither AMD nor Nvidia are keen on letting folks know how to do it. Such freedom of choice would clearly benefit consumers, but neither company sees it as being in their financial interest.

WHERE'S THE BEANO?

My younger brother got a new computer for his birthday. It works great for most things (Knights of the Old Republic II won't run properly, but we already diagnosed a videocard incompatibility issue), but it has an unusual quirk: Every once in a while when the computer shuts down, it farts.

I'm serious. At the exact instant the computer finishes shutting down, the speakers (which are pretty old) emit a noise not unlike what escapes from a whoopee cushion. It doesn't affect anything, and the speakers work fine otherwise, but I was wondering what could cause this.

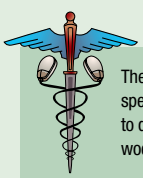
—Aaron Davis

Unfortunately, the Doctor doesn't have much of an answer for you—this question has stumped even me. Perhaps the noise escapes due to an electrical surge that occurs as the PC powers down.

The speakers are the most likely culprit. Have you tried using different headphones or a different set of speakers? This would help you determine whether your problem stems from your admittedly old speakers or your computer.

If it's the computer, and the noise is truly bothering you, start mixing up your components to isolate the problem. Install a new power supply. Or try switching to onboard audio (if you're running a soundcard) and see if that fixes things.

No matter the solution, isolating the problem is the first–and most important–step you can take when dealing with an unknown issue. That said, the Doctor is willing to bet that your speakers are the source of your cybernetic flatulence. He used to have the same problem when he connected his computer to an amplifier, which the speakers were then hooked up to. But he digresses; check those speakers! MPC



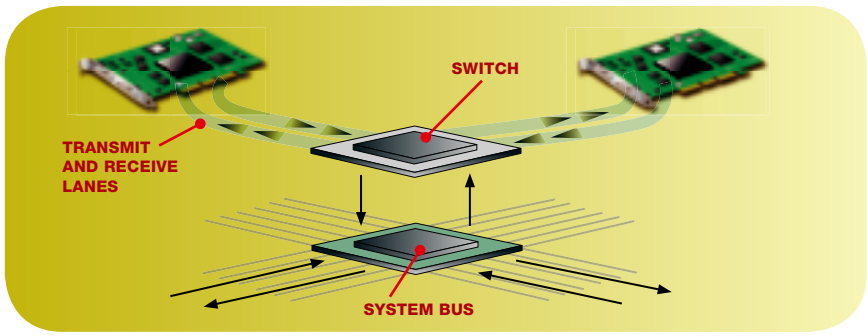
The Doctor reminds you that the weighted magazine you are holding cannot speak. In the event that the weighted magazine does speak, the Doctor urges you to disregard its advice. Only the Doctor need give you advice for your computer woes, and only after you send your problems to **doctor@maximumpc.com.**

White Paper: PCI Express 2.0

The PCI Express 2.0 spec was finalized one year ago this month, and we're finally seeing new motherboards and videocards designed for the standard. Let's look at PCI-E's evolution.

BY GORD **GOBLE**

HOW IT WORKS **The PCI Express Interface**



Point-to-point communication and a switch are key ingredients in the secret sauce that endows PCI Express with its awesome bandwidth. Each lane can acquire exclusive access to the switch, so none of them must compete for bus bandwidth. In this respect, PCI Express behaves much like a LAN.

The Peripheral Component Interconnect Special Interest Group (more commonly known as the PCI-SIG) unveiled the PCI Express 2.0 specification in January 2007. If you're surprised that it took motherboard and GPU manufacturers nearly a year to introduce products based on this technology, keep in mind that it took 14 years for the industry to get *this* far.

The PCI concept was unveiled way back in 1993, at a time when the PC was just beginning its evolution from glorified word processor and oversized calculator to the full-fledged entertainment and business hub it is today. The ISA (Industry Standard Architecture) bus used in the original IBM PC-compatible architecture was too slow and primitive to handle the new CPUs, videocards, and peripherals being introduced.

Two other bus architectures, MCA (IBM's proprietary Micro Channel Architecture) and EISA (the open Extended Industry Standard Architecture championed in large part by Compaq), preceded PCI, but neither technology gained significant traction. The VESA bus (promulgated by the Video Electronics Standards Association as a means of enabling faster video performance) was introduced shortly after MCA and EISA. VESA's popularity was also brief, but the concept of providing an expansion slot dedicated to bandwidth-hungry devices such as videocards lived on.

LEARNING TO CRAWL

Intel spearheaded development of the PCI bus in order to provide a direct connection between add-in cards and system memory and a bridged connection between add-in cards and the CPU via the front-side bus. The bridge was necessary because the PCI bus was clocked at a much lower frequency than the CPU. PCI delivered much more bandwidth than ISA (133MB/s, compared to ISA's paltry 5MB/s), and it delivered plug-and-play capabilities that eliminated the need for jumpers and DIP switches.

The PCI-SIG consistently improved PCI's performance, and the bus remains viable today, but its usefulness is limited. Since all PCI devices must share the same bandwidth, the bus hobbled videocard performance. Intel also realized that PCI wasn't fast enough for graphics, so the company introduced AGP (Accelerated Graphics Port) in 1997. AGP, as its name implies, is not a true bus, but it did provide direct access to system memory and the CPU via the front-side bus. It also offered twice the bandwidth of the PCI bus: 266MB/s. AGP's bandwidth increased to 2.1GB/s with the 2002 rollout of AGP 8X, but since the architecture was limited to a single slot, early dual-videocard solutions such as 3Dfx's Voodoo SLI (Scanline Interleave) remained dependent on PCI.

PCI Express hit the market in 2004. This architecture delivers the same type of point-to-point connection that AGP has to offer; unlike AGP, however, PCI Express supports multiple devices through the use of a shared switch. Rather than having each device negotiate for the use of the bus, each PCI Express device is granted direct and exclusive access to the switch. And instead of dividing bandwidth between multiple devices, as the PCI bus does, each PCI Express device is provided its own dedicated pipeline. In this respect, PCI Express behaves much like a tiny network on the motherboard.

Data is transmitted serially in packets through two pairs of transmit-and-receive wires called lanes. A one-lane (x1 or by-one) PCI Express connection can carry one bit per cycle in each direction to deliver bandwidth of 2Gb/s in each direction. Multiple lanes can be grouped together, so an eight-lane (x8 or by-eight) PCI Express slot delivers 2GB/s in each direction, and an x16 slot provides 4GB/s each way.

You might also see PCI Express bandwidth expressed in terms of GT/s (GT stands for gigatransfers). Data traveling over PCI Express has a clock embedded in it: Every eight bits of data are encoded into a 10-bit symbol that is decoded when it reaches the receiver. So the bus needs to transfer 10 bits in order to send 8 bits of encoded data. A single PCI Express 1.1 lane, for instance, is capable of a raw data rate of 2.5GT/s, but its *effective* data rate is 2.5 x (8/10) or 2Gb/s.

PCI EXPRESS 2.0

PCI Express 2.0 doubles the data rate of each lane to 5GT/s, or an effective data rate of 4Gb/s. That means an x16 PCI Express slot will be capable of delivering a staggering 8GB/s in usable bandwidth. Videocards will likely continue to be the biggest beneficiaries of the new standard, and not only from the perspective of data throughput. PCI-SIG is working on a new power spec that feeds these power-hungry beasts more wattage.

Even midrange videocards, such as those based on Nvidia's new GeForce 8800 GT and AMD's Radeon HD 3870, need more power than the 75 watts a PCI Express 1.1 slot can deliver. These cards are equipped with additional 6-pin power sockets that draw another 75 watts directly from the power supply; high-end cards have two such sockets to draw a total of 225 watts each. PCI-SIG president Al Yanes tells us that the consortium is working on a new power specification "that will support an increased power need to 225 or 300 watts. This spec is targeted for release in the first quarter of 2008."

The new spec also offers dynamic link-speed management, so the speed of each lane can be increased or decreased on an as-needed basis. This should reduce power consumption, which would be particularly useful for battery-operated notebook PCs. A new link-bandwidth notification scheme will be able to notify software (such as the operating system or a device driver) of any changes to link speed and width. And new access-control services are available to help manage peer-to-peer transactions over the bus.

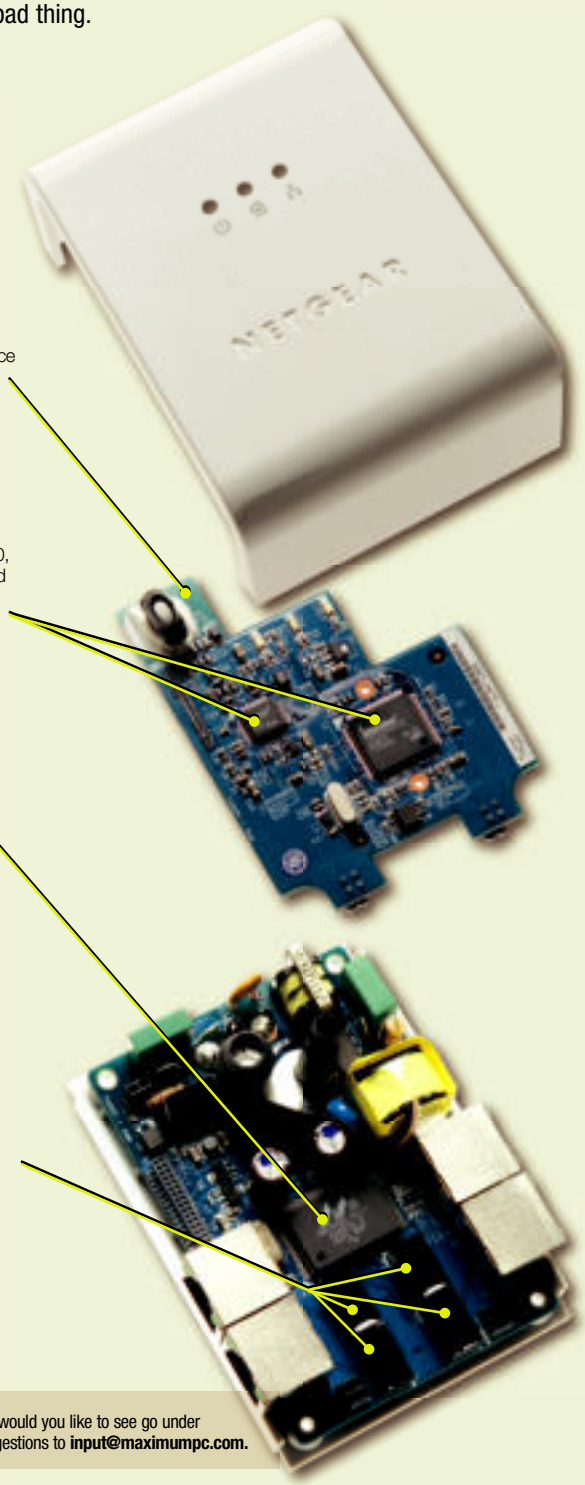
PCI Express 2.0 will be backward-compatible with PCI Express 1.1, so products designed for the older spec will continue to work in the new architecture. Obtaining the full benefit of the new technology, of course, will require that both the peripheral and the motherboard support the new standard. The fact that Intel just recently began shipping chipsets (the X38 Express) that support the new spec explains why only the very newest GPUs from AMD and Nvidia support PCI Express 2.0. AMD and Nvidia are lagging behind Intel on the chipset side. AMD announced that its new R790 chipset would support PCI Express 2.0 as we went to press. Nvidia is widely rumored to be adding support for the new spec to its unannounced nForce 7 series chipset.

Will you benefit from an early upgrade to PCI Express 2.0? "Initially, only the performance-centric solutions will move [to the new standard]," says Yanes. "But eventually, all will support it since it has functional enhancements that all new PCI-E solutions will want…. Graphics cards have been the solution demanding the most performance. We expect that to continue." Other early adopter technologies will include enterprise-class storage products and high-speed networking.

Or you could wait for PCI Express 3.0. That standard is expected to increase the interconnect's bitrate to 8GT/s per lane. That would enable an x16 slot to deliver bandwidth of 12.8GB/s—but products based on that spec aren't expected to reach the market until 2010. MPC

Powerline Networking

Traditional Ethernet cable and reliable Wi-Fi signals simply can't reach some locations. That's where powerline networking adapters come in. Whether it's a security camera in a Wi-Fi-free location or simply a streaming box in your basement, a relatively low-speed easy connection isn't always a bad thing.



DAUGHTERBOARD: This daughterboard contains the hardware required to transmit data over power lines. Additionally, it contains the tiny signal LEDs that display the status of the device when it's turned on.

INTELLON 5500CS: The Intellon 5500CS chipset consists of two parts, the INT5500, which contains the powerline Ethernet interface (including the Media Access Control and physical connection hardware), and the INT1200, which converts the analog signal carried on the power network to a digital signal the INT5500 can understand.

MARVELL 88E6060: This massive chip is a Marvell Ethernet controller, which controls the four traditional Ethernet ports on this Homeplug adapter. It's connected to the Intellon chipset on the daughterboard.

ETHERNET SWITCHES: These boxes contain the hardware that lets devices communicate with each other across the adapter's four traditional Ethernet ports. These switches allow direct port-to-port connections between all four ports on the switch.

Any requests? What hardware—new or old—would you like to see go under *Maximum PC's* autopsy knife? Email your suggestions to **input@maximumpc.com.**

GORDON **MAH UNG**

Mulls Overclocking

Cheapskates, rejoice! Bargain chips yield biggest overclock

OVERCLOCKING RESULTS FOR INTEL AND AMD CPUs

CPU	CORE	STOCK SPEED	OVERCLOCK	PRICE
PENTIUM E2160	Allendale	1.80GHz	87%	$74
CORE 2 DUO E6300	Conroe	1.86GHz	55%	$163
CORE 2 DUO E4500	Allendale	2.20GHz	50%	$113
CORE 2 QUAD Q6700	Kentsfield	2.66GHz	29%	$530
ATHLON 64 X2 4200+	Brisbane	2.2GHz	24%	$78
ATHLON 64 X2 BE-2350+	Brisbane	2.1GHz	24%	$96
ATHLON 64 X2 6000+	Windsor	3GHz	9%	$167
ATHLON 64 X2 6400+	Windsor	3.2GHz	7%	$220

Performed on an eVGA 680i SLI motherboard, 2GB Corsair Dominator 8500 RAM, a PC Power and Cooling 1KW PSU, and standard air cooling.

One clear lesson that came from all the overclocking I did for this month's cover story is that bargain processors kick butt over their pricier brethren when it comes to increased clock output. The most impressive pure clock-speed gain I saw was with the Pentium E2160 chip. That sucker jumped from 1.8GHz to 3.37GHz—roughly an 85 percent overclock! Our gauge of success wasn't just a post and screen grab, either. I used Prime95 to stress-test the processors.

Perhaps the most disappointing results were with AMD's older 90nm Windsor cores. These make up the company's fastest Athlon 64 X2 CPUs, but neither the new Black Edition Athlon 64 X2 6400+ nor the X2 6000+ coughed up many extra megahertz. I saw less than a 10 percent clock bump from either chip. And I'm not alone. I spoke to an OEM representative who said his company was also seeing only minor overclocking results from its Windsor core processors.

Even though AMD has decided to unlock its X2 6400+ as a reward to overclockers, it doesn't seem that there's really any point to it. AMD's 65nm Brisbane CPUs performed a bit better, with stable 25 percent overclocks, but they paled against budget Intel dual cores, which all allowed for overclocks of more than 50 percent. Intel's Core 2 Quad Q6700 was another impressive processor. Although we saw but a 30 percent clock increase, that's not bad for a $500 CPU, especially when the pricier Core 2 Extreme QX6850 doesn't go that much farther. Of course, your mileage may vary. We decided to stick with standard air-cooling for all of our tests; water or phase-change/hybrid solutions would likely yield even better results.

Overclocking has its risks, but the rewards can be well worth it.

I've long believed that the bulk of overclockers aren't pushing $1,000 CPUs as far as they can go. It's really the guys and gals buying the $180 CPUs who are trying to get as much bang for the buck as possible.

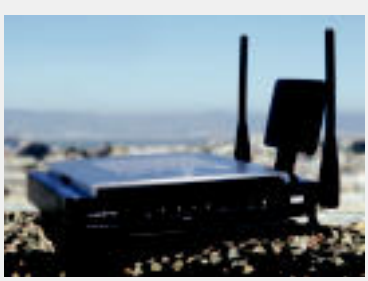
Michael Brown

Re-examines 802.11n Draft 2.0 Routers

Real-world testing yields surprising results

I believe in real-world testing, but since I was living in an apartment when I wrote our router roundup in the November issue, I tested the products in our corporate office. I suspected that this environment—with its concrete floors and ceilings, aluminum-stud walls, and multiple wireless networks—would be more hostile than the typical home.

Imagine my surprise when the benchmark results in the environment of my newly built house turned out to be remarkably similar to my office results. Since the MIMO (multiple input/multiple output) technology at the heart of the 802.11n standard benefits from bounced and reflected signals, I presume that the concrete floors and ceiling and the aluminum studs actually enhanced the routers' performance—bouncing and multiplying the signals as they traveled to the remote client.



My new home is located on what was once a dairy farm, so I had earlier hypothesized that the absence of competing wireless networks would result in much better performance. Now I think that all the metal and concrete in the office was more conducive to MIMO's signal propagation than my home's wood-frame construction.

Two aspects of my house's design had a highly negative impact on range and throughput. The routers had a difficult time penetrating my double-walled, double-insulated media room. The room is fabulous from an acoustic perspective, but it's practically a Faraday cage when it comes to wireless (I hard-wired it with CAT5e). Reaching clients outside the house was also difficult because the exterior walls are clad in dense fiber-cement siding.

Despite all this, I still think my house is a better real-world environment than the office. You'll find additional information about my Wi-Fi testing methodology at MaximumPC.com (**http://tinyurl.com/yo8qa4**).

How We Test

Real-world benchmarks. Real-world results

We use the following multithreaded apps to test a PC's performance relative to our zero-point test bed:

Adobe Premiere Pro CS3: We take HD video shot on a pro Sony camera and output the edited results to a Blu-ray-friendly MPEG-2 file format. This test favors clock speed and likes quad-core CPUs.
Adobe Photoshop CS3: A gazillion Photoshop filters are applied to a RAW digital-image format.
Photodex ProShow Producer: This pro-level photo slide-show application spits out a hi-def MPEG-2 file format and favors multicore CPUs.
Mainconcept Reference: We take an HD-resolution MPEG-2 file and convert it to H.264/AVC with this multithreaded encoder. Used by advanced amateurs and professionals, this encoder likes fast, efficient multicore procs.
FEAR: Our DX9 gaming test runs at 1600x1200 with soft shadows and is a good approximation of gaming performance for slightly older titles.
Quake 4: Based on the Doom 3 engine, this OpenGL shooter is optimized for dual-core CPUs, and although older, it still reveals weaknesses in OpenGL drivers.

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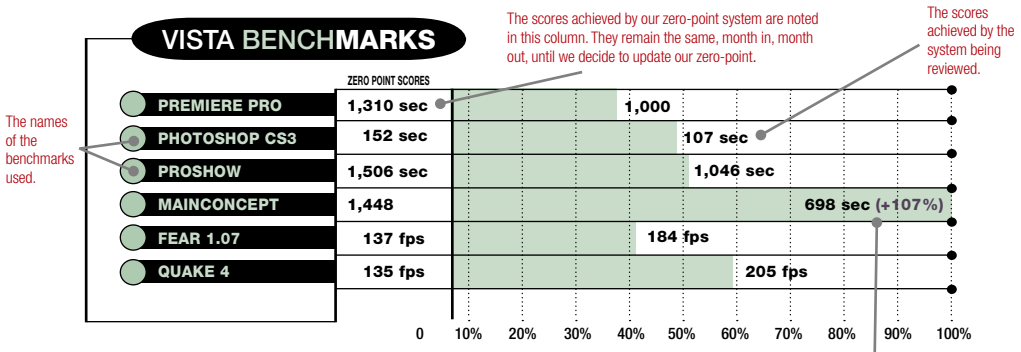
For web-exclusive hardware, software, and game reviews, head to **www.maximumpc.com/exclusive** today. Here are just a few of the many reviews you'll find online at MaximumPC.com.

- Seagate FreeAgent Pro
- Buffalo TeraStation Live
- Toshiba Gigabeat T400 Media Player
- OWC NASPerform
- LaCie Ethernet Big Disk
- Tannoy i30 iPod Speaker Dock
- Western Digital My Book Home Edition
- Logitech G51 Surround Sound Speakers
- QNAP TS-109 Pro
- Call of Duty 4: Modern Warfare
- Gears of War

How to Read Our Benchmark Chart

Maximum PC's test beds double as zero-point systems, against which all review systems are compared. Here's how to read our benchmark chart.



Our current desktop ted bed consists of a quad-core 2.66GHz Intel Core 2 Quad Q6700, and 2GB of Corsair DDR2/800 RAM on an EVGA 680 SLI motherboard. We are running two EVGA GeForce 8800 GTX cards in SLI mode, Western Digital 150GB Raptor and 500GB Caviar hard drives, LG GGC-H20L, Sound Blaster X-Fi, and PC Power and Cooling Silencer 750 Quad. OS is Windows Vista Ultimate

Every month we remind readers of our key zero-point components.

The bar graph indicates how much faster the review system performed in respect to the zero-point system. If a system exceeds the zero-point performance by more than 100 percent, the graph will show a full-width bar and a plus sign.

BEST OF THE BEST

Our monthly category-by-category list of our favorite products. New products are in red.

High-end videocard
XFX GeForce 8800 Ultra

Midrange videocard
EVGA e-GeForce 8800 GT SSC 512MB
Fast, affordable, and comes with PCI-E 2.0

Soundcard
Creative Labs X-Fi XtremeGamer Fatal1ty Pro Series

Hard drive
Seagate 1TB Barracuda 7200.11
With a higher areal density, this drive outperforms all other 1TB comers

External backup drive
Seagate Freestyle Pro 750GB
A stylish 750 gigabytes—with eSATA, to boot

High-def burner
LG GGW-H20L
Burn a full Blu-ray disc in about 20 minutes and read HD DVD movies, too

DVD burner
Samsung SH-203B

High-end LCD monitor
Gateway XHD3000
Finally, a 30-inch monitor with a scaler and multiple inputs

Budget LCD monitor
Samsung SyncMaster 206BW

Socket AM2 Athlon 64 mobo
Gigabyte GA-M59SLI-S5

Socket 775 Core 2 Duo mobo
Asus P5E3 Deluxe WiFi-AP@n
Penryn support and spanking-fast performance

HD-based MP3 player
Apple iPod

Flash-based MP3 player
Toshiba Gigabeat T400
A great UI and WMA lossless-support best other MP3 players

5.1 speakers
Gigaworks S750

2.0 speakers
Audioengine 5

Midtower case
Antec Nine Hundred

Full-tower case
Gigabyte 3D Mercury
No-fuss integrated water cooling

Games we are playing Call of Duty 4: Modern Warfare, Hellgate London, Guitar Hero III: Legends of Rock, The Witcher, Richard Garriott's Tabula Rasa, Team Fortress 2

EVGA e-GeForce 8800 GT SSC Edition

512 is the new 256, at least according to Nvidia

EVGA pumped up the 8800 GT's core and memory clocks, but it's sticking with a reference-design cooler.

Previous generations of Nvidia GPUs (AMD's, too) presented buyers with a difficult choice: You could get great 3D performance for gaming or you could offload high-definition video decoding from the host CPU, but you couldn't have both. Nvidia's 8800 GT not only changes that situation, it does so at a competitive price.

The 8800 GT delivers stronger 3D performance than the industry's previous sweet spot (the 8800 GTS with a 320MB frame buffer), it delivers more memory than that board, and it clubs AMD's far-more expensive Radeon HD 2900 XT over the head for good measure (although AMD has responded with the Radeon HD 3870, see page 80). Nvidia managed to cram 754 million transistors into this beast thanks to a die shrink and a 65nm fabrication process (previous 8800-series GPUs were manufactured using a 90nm process).

The new part packs 112 stream processors, 512MB of GDDR3 memory, and a 256-bit memory interface into a GPU that requires a single-slot cooler (the fan howls like a banshee on startup but goes whisper-quiet as soon as Windows launches). Reference-design boards will run their cores at 600MHz and their memory at 900MHz; EVGA pumps these numbers to 700MHz and a cool 1GHz, respectively. The company also commands a premium price for the speed boost: While the average price for more typical boards was running around $270, this SSC Edition was fetching $330 at press time.

As mentioned above, the new GPU is capable of offloading the entire HD decode process from the host CPU, and it also provides HDCP decryption on both DVI links. This latter feature renders the chip capable of displaying Blu-ray and HD DVD movies at the native resolution of a 30-inch LCD. It's also compliant with PCI Express 2.0 (see the White Paper on page 72 for more details). We didn't test this card in that type of motherboard—no one's shipping one in an SLI configuration just yet—but the new architecture offers double the bandwidth of PCI Express 1.1 (8GB/s in each direction).

AMD moved to GDDR4 memory several iterations back, but Nvidia continues to stick with GDDR3—and the decision doesn't seem to be costing its cards anything in terms of performance. Interestingly, AMD has retreated from its 512-bit memory interface, building a 256-bit interface into the 3870 (same as the 8800 GT). But there are still two other features that could hold the 8800 GT back when it comes to competing with AMD's Radeon 3870: First, these cards have only one SLI connector. Nvidia's other cards, from the 8800 GTS on up, have two SLI connectors, even though only one of them is used in dual-card mode. Why worry about it? Nvidia will inevitably debut an SLI version that enables you to run more than two GPUs on one motherboard (remember quad SLI?), and that's why the other cards have two SLI connectors. You'll never be able to run more than two 8800 GTs in one box.

BENCHMARKS

WINDOWS XP (DIRECTX 9)	EVGA E-GEFORCE 8800 GT SSC EDITION	ASUS EAH3870 (RADEON HD 3870)	EVGA E-GEFORCE 8800 GT SSC EDITION (IN SLI)
3DMARK06 GAME 1 (FPS)	**30.0**	24.6	47.3
3DMARK06 GAME 1 (FPS)	**22.9**	21.3	37.2
WORLD IN CONFLICT (FPS)	**32.0**	22.0	38.0
LOST PLANET (FPS)	**34.3**	23.4	48.8
WINDOWS VISTA (DIRECTX 10)	**EVGA E-GEFORCE 8800 GT SSC EDITION**	**ASUS EAH3870 (RADEON HD 3870)**	**EVGA E-GEFORCE 8800) GT SSC EDITION (IN SLI)**
3DMARK06 GAME 1 (FPS)	**28.0**	24.0	46.9
3DMARK06 GAME 1 (FPS)	**22.3**	21.3	37.7
WORLD IN CONFLICT (FPS)	20.0	**23.0**	23.0
LOST PLANET (FPS)	22.0	**24.2**	35.3

Best single-GPU score bolded. AMD-based cards tested with an Intel D975BX2 motherboard; Nvidia-based cards tested with an EVGA 680i SLI motherboard. Intel 2.93GHz Core 2 Extreme X6800 CPUs and 2GB of Corsair DDR RAM used in both scenarios. Benchmarks performed at 1920x1200 resolution on ViewSonic VP2330wb monitors.

SPECS

	STOCK GEFORCE 8800 GT	EVGA E-GEFORCE 8800 GT SSC EDITION	STOCK RADEON HD 3870
STREAM PROCESSORS	112	112	320
FRAME BUFFER	512MB GDDR3	512MB GDDR3	512MB GDDR4
CORE CLOCK SPEED	600MHz	700MHz	775MHz
MEMORY CLOCK SPEED	900MHz	1GHz	1.125GHz
MEMORY INTERFACE	256-bit	256-bit	256-bit

No quad for you! With only one SLI connector, it looks as though the 8800 GT will be limited to dual-GPU configurations.

The other advantage AMD will soon offer is the ability to run more than one monitor in CrossFire mode, although that will likely require AMD's new RD790 chipset (which hasn't been released). Nvidia's SLI system shuts off the second monitor when running in SLI mode (as does the current version of CrossFire).

While we're looking at the future, we should also consider the fact that, unlike the Radeon HD 3870, the 8800 GT does not support Microsoft's Direct3D 10.1 and Shader Model 4.1. Given the tepid response that most developers have given Windows Vista, and Microsoft's continued insistence on tying DX10's fortunes to its new OS, we don't think this shortcoming matters much at all.

It's been a long time since we've been able to unabashedly recommend a videocard priced this low. We just couldn't get excited about the anemic 8800 GTS; and until now, AMD has had nothing meaty to offer. But the 8800 GT is an absolutely fantastic value, delivering great gaming performance and features that can't be found in Nvidia's higher-end boards. If you can swing the price, you'll get a better gaming experience from a GeForce 8800 GTX or an Ultra (although we don't think the latter is worth its premium); but if you're rolling with a lower budget, the 8800 GT is a slam-dunk winner.

—MICHAEL BROWN

EVGA E-GEFORCE 8800 GT SSC

OLD POTRERO

Scorching gaming performance; complete solution for HD-video decoding; fabulous price.

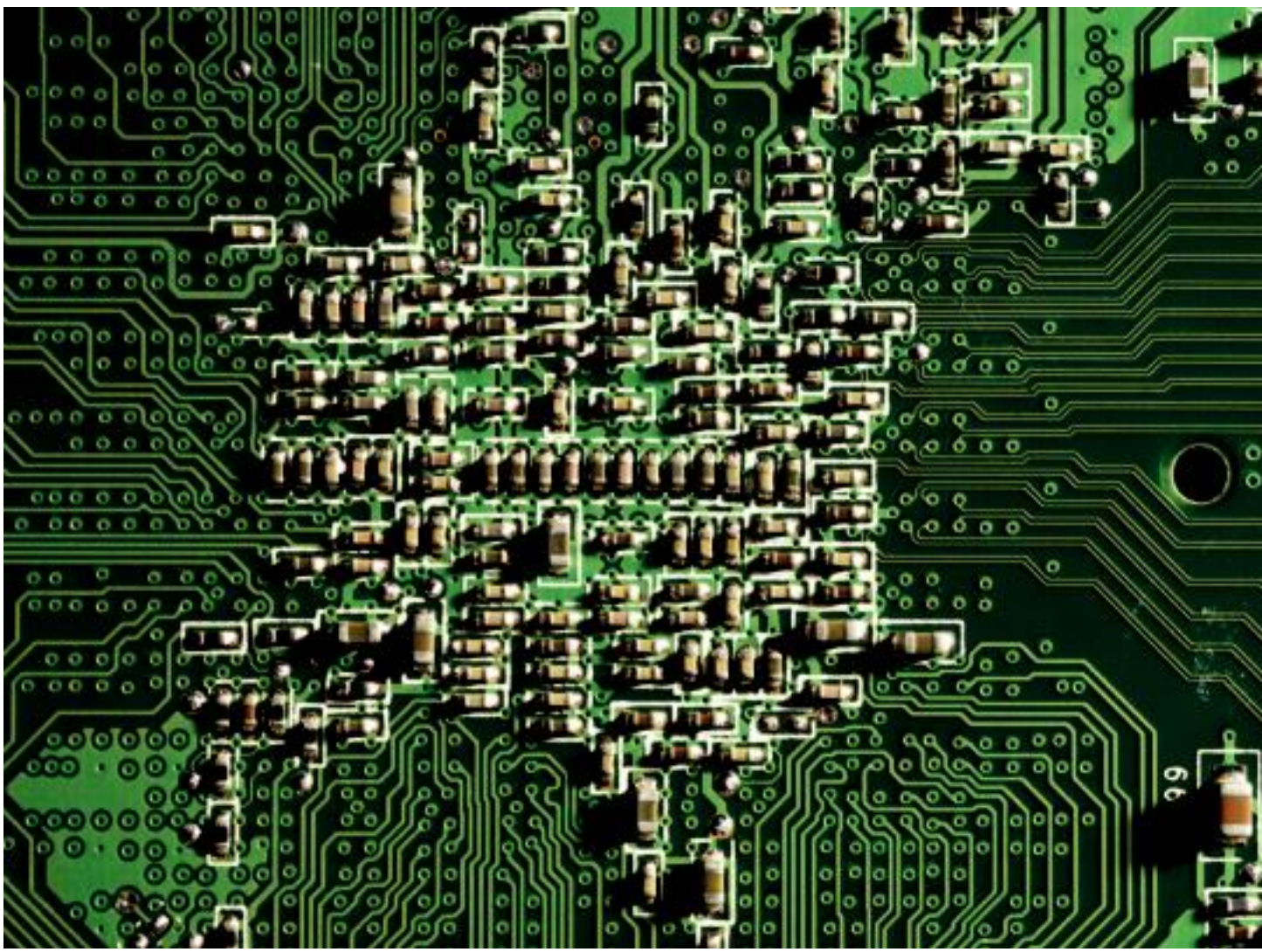
OLD GRANDDAD

Only one SLI connector; no support for DX10.1.

9

MAXIMUM PC KICKASS

$330, www.evga.com



Nvidia's new GeForce 8800 GT is packed with a staggering 754 million transistors.

Wi-Fi Watusi

Gettin' down with new 802.11n routers from Belkin and Trendnet

Trendnet's Wireless N Gigabit delivers a strong feature set but also slow speeds and poor range.

Belkin's N1 Vision and Trendnet's Wireless N Gigabit are among the first routers to be benchmarked in our new real-world test environment: a 2,800 square-foot foot home in rural Northern California (call it Maximum PC Lab North). You'll find all the details, including photographs, at MaximumPC.com (**http://tinyurl.com/yo8qa4**).

—MICHAEL BROWN

BELKIN N1 VISION (F5D8232-4)

Belkin's N1 Vision takes user friendliness to a whole new level. This is the first router we've seen that offers extensive installation hand-holding right in the firmware—there's no need to drop a CD in your drive.

The N1 Vision earns its name from the large LCD that reveals your network's broadband speed, bandwidth consumption, time of day, the status of networked devices, and other useful information. And unlike the piddling four-port Fast Ethernet switch on Belkin's N1, the N1 Vision packs a four-port Gigabit switch.

Enable the Guest SSID feature and the N1 Vision will set up a second password-protected network that enables authorized clients to access the Internet without granting them entrée to the rest of your network.

Belkin's N1 Vision router lives up to its name.

The other N1 couldn't connect through our double-walled media room, but the N1 Vision connected to our mobile client at its furthest point outside the house (90 feet from the router); however, we presume radio waves have a difficult time penetrating the cement-fiber siding on the home we're using for testing because none of the routers we've tested so far has performed well when the client is outdoors.

Many of the N1's other limitations are also present in this fancier model: The Vision operates only in mixed mode (802.11b, -g, and –n), for instance, and its only useful quality-of-service option is "off." The N1 Vision is a better choice for networking neophytes than the N1, but power users will crave more meat.

BELKIN N1 VISION

VISIONS
Easy setup, great display, Gigabit switch, guest SSID feature.

HALLUCINATIONS
Lacks advanced configuration features; operates in mixed mode only.

7

$180, www.belkin.com

TRENDNET WIRELESS N GIGABIT (TEW-633GR)

If you've already installed a Wi-Fi router, you don't need the vendor's installation software to help you through the process. So we weren't surprised that Trendnet didn't develop anything for its TEW-633GR 802.11n Draft 2.0 product, relying instead on Pure Networks' Network Magic.

But we feel obligated to evaluate each company's installation routine, and we were torqued to find that Trendnet's resulted in the free, basic version of Network Magic in residence on our system. We've recommended Network Magic in the context of an expert installing it on other people's rigs to avoid becoming the default tech-support monkey for friends and family, but it's not an app power users will need on their own machines. We're not saying that Network Magic installed itself surreptitiously, but it gives no indication of what it is about to do until it's already done it—and that's bad etiquette.

We weren't very impressed with Trendnet's hardware, either. As you can see from the benchmark chart, the router delivered tremendous wireless TCP throughput without encryption, but rates fell through the floor when we enabled WPA Personal security with an AES cipher. The router couldn't reach the client in the second of our outdoor tests with or without security enabled.

The TEW-633GR does have a strong feature set, including push-button WPS (Wi-Fi Protected Setup), a four-port Gigabit switch, and Ubicom's StreamEngine quality-of-service technology. But those attributes are of little value without fast wireless throughput.

TRENDNET WIRELESS N GIGABIT

SHAKIN' ALL OVER
StreamEngine, WPS, Gigabit switch.

CONVULSIONS
Slow; Network Magic installs itself on your system.

6

$130, www.trendnet.com

BENCHMARKS

	LOCATION 1 NO ENCRYPTION/ WPA PERSONAL	LOCATION 2 NO ENCRYPTION/ WPA PERSONAL	LOCATION 3 NO ENCRYPTION/ WPA PERSONAL	LOCATION 4 NO ENCRYPTION/ WPA PERSONAL	LOCATION 5 NO ENCRYPTION/ WPA PERSONAL
BELKIN N1 VISION (MB/S)	70.1 / **35.1**	69.8 / **29.5**	13.2 / **8.4**	11.8 / **9.4**	1.9 / **0.1**
TRENDNET WIRELESS N GIGABIT (MB/S)	76.5 / 27.4	59.4 / 16.2	1.4 / 1.1	1.4 /0.1	N/C

Best encrypted scores are bolded. N/C means no connection could be established between client and router. Additional test criteria available at MaximumPC.com (http://tinyurl.com/yo8qa4).

Asus EAH3870

AMD is (finally) back in the hunt!

AMD has pulled a rabbit out of its hat by transforming the near-debacle that was the R600 architecture into a serious mainstream contender: The Radeon HD 3870.

The new GPU delivers several important features left out of AMD's previous best effort: the Radeon HD 2900 XT. The most important of these is the inclusion of AMD's Unified Video Decoder, which offloads all high-definition video decoding chores from the host CPU. The new part supports HDCP on both DVI links, too, so Blu-ray and HD DVD movies can be displayed at the native resolution of a 30-inch panel. There's also support for new technologies such as PCI Express 2.0, Direct3D 10.1, and Shader Model 4.1, although it remains to be seen how important these features will be in the near future. (Nvidia's new 8800 GT is also PCI Express 2.0 compliant, but it doesn't support DirectX 10.1.)

BENCHMARKS

	EVGA E-GEFORCE 8800 GT SSC EDITION	ASUS EAH3870 (RADEON HD 3870)
WINDOWS XP (DIRECTX 9)		
3DMARK06 GAME 1 (FPS)	**30.0**	24.6
3DMARK06 GAME 1 (FPS)	**22.9**	21.3
WORLD IN CONFLICT (FPS)	**32.0**	22.0
LOST PLANET (FPS)	**34.3**	23.4
WINDOWS VISTA (DIRECTX 10)		
3DMARK06 GAME 1 (FPS)	**28.0**	24.0
3DMARK06 GAME 1 (FPS)	**22.3**	21.3
WORLD IN CONFLICT (FPS)	20.0	**23.0**
LOST PLANET (FPS)	22.0	**24.2**

Best scores are bolded. AMD-based cards tested with an Intel D975BX2 motherboard; Nvidia-based cards tested with an EVGA 680i SLI motherboard. Intel 2.93GHz Core 2 Extreme X6800 CPUs and 2GB of Corsair DDR RAM used in both scenarios. Benchmarks performed at 1920x1200 resolution on Viewsonic VP2330wb monitors.

Consumers finally have a real choice in GPUs. The Radeon HD 3870 at the heart of Asus's EAH3870 is a genuine contender.

Asus's EAH3870 is the first retail board we've examined that uses the 3870 part, and we're impressed: It's been a while since we've been able to laud anything other than an Nvidia-based videocard with a Kick Ass award. This card is not only powerful, it's also affordably priced at $260 (and includes the first-rate game Company of Heroes: Opposing Fronts).

AMD promises we'll see other cards based on this GPU selling for $220, but those will likely come with reference-design clocks. In this case, Asus bumped the 3870's core clock speed to 851MHz and the card's 512MB of GDDR4 memory to 1.143GHz (from AMD's reference-design speeds of 775MHz and 1.125GHz, respectively). Asus had just begun shipping these cards and was able to provide us with only one, so check MaximumPC.com for an updated review with CrossFire numbers.

Great job, AMD! Now get back into the lab and build a new GPU that can compete at the high end of the market.

—MICHAEL BROWN

ASUS EAH3870

$260, www.asus.com

9

MAXIMUM PC KICKASS

Combo Drive Comeuppance

Two optical drives seek to bridge the technological divide

So your DVD burner is getting a little long in the tooth and you're ready for an upgrade, but you're not all that keen on adopting next-gen tech. And who can blame you? Even the falling price of hardware doesn't make up for the relatively slow burn times, costly media, and compatibility issues that plague Blu-ray burners (and the same would be true of HD DVD burners if you could even find them!). Trouble is, you've got a brand-new 27-inch LCD that's just begging to display high-def movies. What's a consumer to do? Well, you could buy a combo drive—one that lets you read next-gen discs and write data to fast, friendly CD and DVD, like the two models we review here.

—KATHERINE STEVENSON

LG's GCC-H20L will read both high-def formats and write to DVDs at decent speeds.

You'll get to watch high-def movies with Asus's BC-1205PT, but only if they come on a Blu-ray disc.

ASUS BC-1205PT

With Asus's BC-1205PT you get to read high-def discs, but only if they're of the Blu-ray variety, so you'll want to have a strong affinity for that format (and its affiliated movie studios) to take the plunge. Because while you do save money by forgoing the ability to write to Blu-ray, the BC-1205PT still isn't cheap. It's a couple hundred dollars more than a high-performance standard DVD drive, and its DVD burn performance is far from top-notch.

The BC-1205PT is rated at 12x for DVD+/-R write speeds—a good deal slower than today's top DVD burners, now at 20x, and not surprisingly, burn times take a hit. It took us 7:12 (min:sec) to fill a single-layer DVD+R with the BC-1205PT, compared to the 5 minutes flat it took our favorite drive, Samsung's SH-S203B (reviewed October 2007). Burning to a double-layer DVD, the Asus drive maintained a 3.96x average speed and filled the disc in 27:09, more than twice the time it took our Samsung. Only when burning to DVD-RW media did the Asus and Samsung perform on par, writing 4.38GB to a single-layer disc at 15:07 and 14:31, respectively. When reading data from all of our test discs, Asus's drive had notably slower seek times than both the Samsung and the LG GCC-H20L reviewed here.

Middling performance aside, the BC-1205PT offers a SATA interface, the CyberLink BD Solution suite for playback and burning chores, and a simple, black face plate.

ASUS BC-1205PT

HALF FULL
Next-gen disc reads, standard-DVD convenience.

HALF EMPTY
No HD DVD support, so-so DVD performance.

6

$280, www.asus.com

LG GCC-H20L

For just $20 more than Asus's drive, LG's GCC-H20L lets you read both HD DVD and Blu-ray discs—a luxury that's well worth the extra cost of admission. The GCC-H20L also affords you slightly better DVD burning performance.

Rated at 16x for DVD+/-R writing, LG's GCC-H20L bested Asus's drive by filling a single-layer DVD+R in 5:51 (min:sec). And its random and full-access times were much lower when reading the disc (100/178ms versus 167/349ms), as was its CPU usage at 8x speed (24 percent versus 43 percent). But when it came time to write to double-layer and rewriteable DVD media, LG's drive was just as ho-hum as Asus's. The GCC-H20L took 27:28 to write 7.96GB to DVD-DL and 15:01 to write 4.38GB to DVD-RW.

Still, we'll gladly take the HD DVD compatibility and faster DVD+/-R writes for a few extra bucks. Like the Asus drive, the GCC-H20L offers a SATA interface, a CyberLink bundle, and a simple, black face plate, so what's there to lose?

LG GCC-H20L

PAY DIRT
Blu-ray and HD DVD disc reads, standard-DVD convenience.

DIRT POOR
Just slightly better than so-so DVD performance.

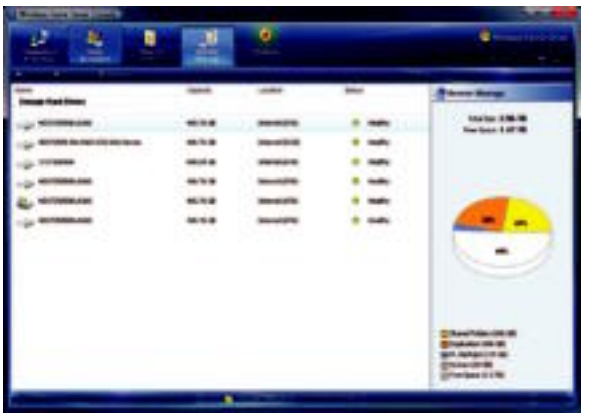
7

$300, www.lge.com

BENCHMARKS

	SAMSUNG SH-S2303B	ASUS BC-1205PT	LG GCC-H20L
DVD+R WRITE SPEED AVERAGE	**13.45x**	9.45x	12.09x
DVD+R READ SPEED AVERAGE	**12.13x**	9.45x	9.24x
ACCESS TIMES (RANDOM/FULL)	**116/198ms**	167/349ms	100/178ms
DVD+DL WRITE SPEED AVERAGE	**9x**	3.96x	3.95x

Best scores are bolded. All tests were conducted using the latest version of Nero CD-DVD Speed and Verbatim media. Our test bed is a Windows XP SP2 machine using a 2.66GHz Intel Core 2 Quad Q6700, 2GB of Corsair DDR2/800 RAM on an EVGA 680 SLI motherboard, two EVGA GeForce 8800 GTX cards in SLI mode, a Western Digital 150GB Raptor and a 500GB Caviar hard drive, a Sound Blaster X-Fi soundcard, and a PC Power and Cooling Silencer 750 Quad PSU.



Home Server features a GUI that dumbs down the basic Windows Server interface without omitting any functionality we need.

Windows Home Server

Finally, a Microsoft operating system we can wholeheartedly recommend

We've long encouraged our readers to embrace the power of a dedicated home server—we love the flexibility an always-on rig provides to host media, important documents, and other vital data. But, it's not a simple proposition—XP isn't particularly well suited to server duties, and setting up and maintaining Linux can be a challenge. That's where Windows Home Server steps in.

Microsoft started with the solid base of Windows Server 2003, then stripped out everything but the necessities. From that bare-bones base, the Home Server team added crucial functionality for home users: Universal Plug and Play (UPnP) media sharing, an automated backup solution, rig health monitoring, and an innovative disk management scheme. The result is a rock-solid piece of software that is outstanding today and hints at even more amazing functionality to come.

Naturally, Home Server includes basic file-sharing functionality, shipping with default shares for music, photos, and video. You can configure per-user permissions for each share and create custom shares for specific purposes. Additionally, you can stream content to an Xbox 360 or other UPnP-compatible client directly from the shares.

Home Server's sexiest feature is Server Storage, which essentially accumulates all the available space on all the hard drives in your system into one massive volume. If you have more than one drive in your system, you can even configure individual shares so that data is automatically stored on more than one hard drive. Configuring a new drive or removing an older drive is a simple procedure.

Once you've installed the included Home Server Connector software on your PCs, it will notify you of any potential problems, like out of date antivirus software or machines that have missed updates. Best of all, Home Server includes everything you need to do automatic backups of up to 10 machines connected to your home network. Restoring those backups is as simple as booting off of the included CD and selecting the backup you want to restore.

While Home Server won't be available from retailers, power users will be able to purchase an OEM bundle from sites like Newegg.com. It's a great piece of software, and it absolutely blows lesser-featured NAS boxes out of the water.

—WILL SMITH

WINDOWS HOME SERVER

$180, www.homeserver.com

TEXT OVERFLOW

Asus P5E3 Deluxe WiFi-AP@n

Intel's new Bearlake X chipset offers up toothy performance

Asus's P5E Deluxe could be the fastest motherboard available today.

We'll be the first to admit that we were unimpressed by DDR3 when we first tested it last year, but there's finally a glimmer of hope.

What changed our minds? Asus's spanking-fast P5E3 Deluxe WiFi-AP@n mobo, which uses the enthusiast-oriented X38 chipset. The X38's main highlights are apparently useful DDR3 support and PCI Express 2.0 support. We say "apparently" in reference to DDR3 because we didn't have a DDR2 version of the board for a direct comparison, but from our tests, the X38 with DDR3 is a winning combination. Also good to have but not a proven performance boost yet is PCI-E 2.0, which doubles the bandwidth of PCI-E 1.0 from 8GB/s to 16GB/s. But does PCI-E 2.0 matter?

Maybe. The jury is still out, but one GPU vendor told us he has seen solid performance boosts from it. We couldn't test this claim because we were unable to lock our PCI-E 2.0 card at PCI-E 1.0 data rates. Of course, you'll also need a PCI-E 2.0 GPU, such as Nvidia's GeForce 8800 GT or AMD's Radeon HD 3870, to see any benefits. The P5E3 Deluxe doesn't include SLI support, but the board can run two graphics cards in CrossFire mode.

This mobo also sports a no-nonsense Asus design: There are no blinged-out gamer LEDs or crazy wind tunnels. But that doesn't mean cooling is an afterthought. A heat pipe keeps the ICH9R south bridge cool and also wraps around the north bridge and voltage-regulation modules.

Other notable features include 802.11n-compliant Wi-Fi support, and the superior Analog Devices audio parts over Realtek hardware.

To test the board and chipset, we set up the P5E3 and an EVGA 680i SLI board with identical hard drives, quad-core CPUs, GPUs, and drivers. However, the P5E3 packed 2GB of Corsair DDR3 clocked at 1,333MHz while the EVGA board used 2GB of Corsair DDR2 RAM clocked at 1,066MHz. With the 2.66GHz Core 2 Quad overclocked to 3.3GHz and running on a 1,333MHz FSB on both platforms, we expected to see minor differences between the two boards, but the P5E3 easily outran the 680i board. The big wins came in gaming, where Quake 4 ran about 11.4 percent faster on the Asus board. FEAR and Valve's Particle Test were also faster on the P5E3 by a comfortable 5 percent margin. In encoding tests, the P5E3 was faster by a shocking 13 percent.

Those are impressive numbers, especially in motherboard land, where clock-for-clock performance increases of 2 percent are viewed as a win. It's also more impressive when you consider that the P35 chipset in DDR3 trim was slower than Nvidia's 680i chipset. However, you'll have to weigh the value of that speed boost against DDR3's premium pricing.

The chipset does not officially support a 1,600MHz front-side bus, but we conducted much of our Core 2 QX9850 Penryn testing with the board's FSB at 1,600MHz with no additional voltage. Intel, however, hasn't certified the X38 as capable of officially supporting 1,600MHz FSB speeds. We won't see 1,600MHz until the X48 ships, probably in January 2008.

The X48 launch will make the X38 one of the shortest-lived enthusiast chipsets in recent memory. Should that trouble you? The "unofficial" FSB doesn't trouble us, but newer is better, and with the X48 launch imminent, the X38 is something of a head-scratcher.

And that's really a shame, as the P5E3 Deluxe is a great board. It's fast and solid and packs just about every feature you would want in an Intel system. Unless you're hung up on getting SLI support, this is clearly one of the best boards available today for Intel.

—GORDON MAH UNG

BENCHMARKS

	ASUS P5E3 DELUXE	EVGA 680I SLI	% DIFFERENCE
VALVE PARTICLE TEST (FPS)	**115**	109	5.5%
FEAR (FPS)	**357**	341	4.7%
QUAKE 4 (FPS)	**234**	210	11.4%
3DMARK05	**18,872**	18,616	1.4%
3DMARK06 CPU	**5,322**	5,242	.98%
PCMARK05 OVERALL	**10,634**	10,463	1.6%
PCM MEMORY	**7,051**	6,942	1.6%
PCM GRAPHICS	13,237	**13,441**	-1.5%
PCM HDD	**7,856**	7,680	2.3%
SCIENCEMARK 2.0 RAM (MB/s)	**6,570**	6,364	3.2%
CINEBENCH	**12,145**	11,958	1.6%
MAINCONCEPT (MIN:SEC)	**24:55**	28:12	13.2%

Best scores are bolded. We used identical 2.66GHz Core 2 Quad Q6700, EVGA 8800 GTX graphics cards, WD Raptor 150GB 10K drives, 2GB of DDR2/1066 RAM and 2GB of DDR2/1333 RAM.

ASUS P5E3 DELUXE WIFI-AP@n

XP-38

Impressively fast and stable motherboard.

V-35

No SLI support; will soon be replaced by an X48 version.

9

MAXIMUM PC KICKASS

$360, www.asus.com

Crysis

Combat is key in this absolutely gorgeous tactical shooter

In Crysis, merely shooting a bad guy isn't the only way to kill him. You can literally blow his house down.

Crysis sets a whole new level for visual quality in games with its unbelievable graphics.

Let's get the obvious stuff out of the way up front. On a properly configured Vista machine with DirectX 10 hardware, Crysis is the best-looking game we've ever played. Its jungle environments are lush and realistic, with plenty of wide-open areas and just a handful of loading screens in the entire game. This incredible level of graphical detail is what PC gaming is all about.

Screenshots don't do this game justice. Seeing Crysis in action will take your breath away. The perfectly rendered jungle scenes, gorgeous beaches, and water that looks better than the real thing set a new high mark for PC graphics and far surpass what we expected from a first-gen DirectX 10 title. Even more surprising, when we tested the game on DirectX 9 hardware, it still looked stunning—although we missed the fancy depth-of-field effect that is used fairly liberally on DX10 systems.

As for the game, it's carved straight from the generic first-person shooter playbook. There are bad guys (North Koreans this go around), who are doing something they shouldn't (unearthing an alien artifact), and a hero (you) with powers (via a supersuit that lets you jump higher, run faster, and be invisible) that make you uniquely capable of accomplishing a challenging goal (saving the world). It's all very predictable. The game mechanics aren't particularly innovative either—we've done all this before.

That's not to say Crysis isn't a fun, well-polished game—it definitely is. It's just not revolutionary from a gameplay perspective. The game's by-the-book weapons include pistols, a shotgun, a rifle or two, and a submachine gun, which you customize with different add-ons: scopes, silencers, grenade launchers, and a few others. While this level of customization could have added some needed depth, you generally end up choosing between the silencer and grenade launcher, depending on the number of baddies you want to take out. Because you'll pick up most of the weapons and add-ons within the first hour or two of the game, and you gain absolutely no new suit capabilities beyond those you start with (armor, superspeed, cloaking, and superstrength), character development feels extremely weak.

Stealth tactics make sense when you're on foot, but when you're driving a 60-ton tank, you need not be subtle.

Where Crysis really excels is in actual combat, especially at the higher difficulty settings. While the AI seems mildly stunted at the default difficulty, at more challenging settings it's more realistic without seeming prescient. The brilliant AI, combined with the open maps, which let you scout an encounter unseen and then approach from the best possible side to crush the enemy, is the game's saving grace.

On easy, Crysis is a forgettable run 'n' gun shooter, which you'll finish in a few short hours. When you crank the game up to the highest difficulty setting, it's a much more tactical experience. You must silently dispatch your enemies while evading detection, or you'll be killed. To up the immersion factor, the game also forces you to use iron sights, and the Korean baddies actually speak Korean. You won't know whether they're talking about the weather or one just saw you skulking through the undergrowth.

Crysis is undoubtedly the type of game that will make your console-playing buddies take note, but compared to other recent shooters, there's virtually no character development. Luckily, the combat is outstanding, more than making up for the game's minor failings.

—WILL SMITH

CRYSIS

NANO SUIT

Stunning graphics and amazing combat. We love skulking around the jungle.

ZOOT SUIT

Aside from obvious graphical improvements, Crysis lacks real innovation.

9

MAXIMUM PC KICKASS

$50, www.ea.com/crysis
ESRB: M

Win Rig of the Month AND WIN BIG!

IF YOUR MODDED PC IS CHOSEN AS A RIG OF THE MONTH, IT WILL:

1. Be featured before all the world in *Maximum PC*
2. Win you a $500 gift certificate for eWiz.com

SO WHAT'S STOPPING YOU?

TO ENTER: Your submission packet must contain your name, street address, and daytime phone number; no fewer than three high-res JPEGs (minimum size 1024x768) of your modified PC; and a 300-word description of what your PC represents and how it was modified. Emailed submissions should be sent to **rig@maximumpc.com.** Snail mail submissions should be sent to Rig of the Month, c/o Maximum PC, 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080.

The judges will be *Maximum PC* editors, and they will base their decision on the following criteria: creativity and craftsmanship.

ONE ENTRY PER HOUSEHOLD. Your contest entry will be valid until (1) six months after its submission or (2) January 1, 2008, whichever date is earlier. Each month a winner will be chosen from the existing pool of valid entries, and featured in the Rig of the Month department of the magazine. The final winner in this contest will be announced in the March 2008 issue. Each of the judging criteria (creativity and craftsmanship) will be weighed equally at 50 percent. By entering this contest you agree that Future US, Inc. may use your name and your mod's likeness for promotional purposes without further payment. All prizes will be awarded and no minimum number of entries is required. Prizes won by minors will be awarded to their parents or legal guardians. Future US, Inc. is not responsible for damages or expenses that the winners might incur as a result of the Contest or the receipt of a prize, and winners are responsible for income taxes based on the value of the prize received. A list of winners may also be obtained by sending a stamped, self-addressed envelope to Future US, Inc. c/o Maximum PC Rig of the Month, 4000 Shoreline Ct, Suite 400, South San Francisco, CA 94080. This contest is limited to residents of the United States. No purchase necessary; void in Arizona, Maryland, Vermont, Puerto Rico, and where prohibited by law.

We tackle tough reader questions on...

✓The 100 Greatest ✓Water Cooling ✓The Trouble with Zippers

TAKE A XANAX AND A DEEP BREATH

I expect you will get quite a few letters complaining about things you left off your list of the 100 greatest PC technologies (December 2007), but I really feel compelled to point this one out. I find it hard to believe that you did not consider the Amiga worthy of mention. You said Win95 allowed for "true multitasking" and "long file names." Well, folks, the Amiga beat it to the punch on both items by several years, and the Amiga had true multitasking. How about desktop animation? Genlocking? Desktop video? Four-channel stereo sound and text-to-speech capabilities?

The Osborne, TRS-80, Commodore 64, and Apple II all made the list, but nothing for the Amigans? Even PC programmers have told me they liked to write their code on an Amiga and then port it to the PC because it's easier. But now that it's dead as dead can be, why do you pretend it never existed?

Pretty much everything the Amiga had has been added to the PC world and treated as if it never existed before Windows. Why do you suppose it is? It is an American thing, by the way. Europeans, especially the British, all love the machine. People are still buying and selling Amigas, and many Amigans have taken to running Amiga emulators on fast PCs to preserve the sweet games and music the Amiga does so well. I am very curious as to why the Amiga doesn't make the list. It seems to have many of the virtues called out as worthy in other products, and had them before anybody else did, yet there it is, not even the bridesmaid much less the bride. Curious.

—William Shirley

EXECUTIVE EDITOR MICHAEL BROWN RESPONDS: Well, imagine my surprise when I discovered the *Maximum PC* conspiracy to bury the history of the Amiga. Being the only card-carrying Amiga fanatic on staff (I own an original Amiga 1000, an A2000, an A500, an A1200, and an A2500 with a Video Toaster), I was intentionally excluded from the planning of this cover story: Editor in Chief Will Smith conveniently held these meetings while I was away on a vendor meeting in Saskatchewan.

They could have told me they were weary of my lauding the Amiga's many breakthroughs, but no, they had to exact revenge.

In my humble opinion, the Amiga itself had enough great innovations to have filled the entire story. In addition to the highlights you pointed out, there was the Live! Board, the world's first affordable real-time video digitizer (remember Mandala?); the Sidecar, an add-on box that imbued the A1000 with all the functionality of a PC XT system; the internal Bridgeboard for the A2000, which emulated a PC AT system; and the incredibly powerful scripting language ARexx.

In any event, when I discovered this duplicity, I insisted that Will allow me to dissect my A1000 for the autopsy in the December issue. I hope you enjoyed it.

BACK IN MY DAY...

Although I enjoyed the article "Greatest 100 PC Technologies" (December 2007), I cannot understand why you didn't make mention of the CP/M operating system. My first machine was based on the 4004 and then the 8008. We then got a Door Frame checker with a Micro-Pac 80 that was based on the 8080. The only interface was a box containing 16 switches for memory and eight for data with others for the registers. It was programmed one byte at a time, and I had to build an EPROM burner to change the different functions of the machine. At the time, I had to hold the EPROM close to a welder's arc to erase it. So it was a great step ahead in 1975 when Gary Kidall wrote the CP/M operating system, which at the time was the only one available. In 1976 Gary founded Digital Research and in

The Great Zipper Catastrophe of '76

I was reading through your Geek Gift Guide (Holiday 2007) and I must say that several of those gifts just might end up on my wish list—especially that oh-so-sweet Pac-Man bonnet.

I happened to notice that your "sleepy geek," as your article referred to the model for the geek fanny pack and bonnet, was wearing footie pajamas. I have been looking for adult-size footie PJs for I can't remember how long, but I have only been able to find the zipper style. The footie PJs that sleepy geek was wearing were button-up. I've got to ask, where did you find the button-up footie set? Do they come in my size? I'm 6' 3" and weigh 260 lbs. It would be totally neat if they did.

I'm highly reluctant to buy zippered pajamas because of a... call it a bad experience when I was eight.

—Will Weist

BUTTERS THE WONDER INTERN (AKA SLEEPY GEEK) RESPONDS: Like you, I met with an unfortunate zipper accident as a child that left me with a permanent limp but did nothing to crush my effervescent spirit. This event has, however, led me to dress myself only with button-, Velcro-, and snap-based clothing (though, truth be told, snaps make me a bit nervous). That said, to purchase the PJs you see in the gift guide, go to http://thepajamacompany.com/store/index.php. If I can help with any of your other sartorial needs, please contact me at 1-800-BUTTERS.

1977 produced M/PM for the 8086 for 16-bit processors and CP/NET for networking. When Digital put CP/M in the public domain, Bill Gates changed the names of various commands and renamed it MS-DOS. He subsequently incorporated Apple's GUI into Windows.

So you see that if it wasn't for CP/M, we wouldn't have the greatly embellished and bloated systems we have today. I am 86 years of age and vividly remember the first mention of a computer, so I have a special love for CP/M, which I still have on the original 8-inch floppies. Among other programs, these discs contain the first USCD Pascal, which I used to program after CP/M was released. Maybe you can pass along this little bit of history.

—Charles W. Jackson

REVISIONIST HISTORY

*I realize that the staff of **Maximum PC** may be young, but if you do the simplest research on the term "killer app," you'd find the term was first applied to VisiCalc (see **http://tinyurl.com/2fxpjs** or **http://tinyurl.com/yoc8zq**), not Lotus 1-2-3, as you state in your December 2007 "Greatest 100" story. While 1-2-3 was a fine product, it was not the source of the term "killer app."*

Perhaps you can correct the error before posting the list online, to avoid further fictionalizing history.

—Bob Frankston

***REALLY* SENIOR EDITOR GORDON MAH UNG RESPONDS: As someone who actually used VisiCalc on a Commodore CBM when it was first ported, I can address your question. The write-up for No. 67 on our Top 100 list actually stated: "…turning 1-2-3 into the PC's first 'killer app.'" At no time did we ever say that it was the first-ever killer app. In fact, Wikipedia agrees with us and says: "(1-2-3) became that platform's killer app, and drove sales of the PC…" (And, no, I didn't just edit Wikipedia to say that.)**

WATER COOLING MAKES THE GRADE

Say what? No liquid cooling listed in "Best of the Best" (December 2007)? Darn it! I am trying to find a good liquid-cooling solution for my otherwise hot dual-core PC.

—Jes Riv

ASSOCIATE EDITOR DAVID MURPHY RESPONDS: We didn't have the heart to pick a water cooler for "Best of the Best." At the time, we hadn't yet found an all-in-one device that performed well enough to earn that designation. We used to believe that water-cooling newbies would be best served by building their own kits, but we've since become fans of Zalman's Reserator XT (reviewed December 2007)—an all-in-one liquid CPU cooler that keeps your processor quite frosty. It came in too late to be considered for "Best of the Best," but it's a winner in our hearts, nonetheless.

CATCH-22

I'm looking at getting a widescreen 22-inch monitor, but your recent reviews of these have indicated that many have a 6-bit vs. 8-bit color problem (that I think I mostly understand).

Do you currently have a favorite 22-inch widescreen monitor? Or should I go for the 20-inch Samsung currently on the Best of the Best list?

—Greg

DEPUTY EDITOR KATHERINE STEVENSON RESPONDS: For readers who don't know about this issue, 6-bit LCD panels have far fewer colors natively than 8-bit panels (262,144 vs. 16.7 million), but they employ techniques such as "frame rate control" to simulate a more extensive color palette. These panels are cheaper to produce and thus make it possible for vendors to offer 22-inch screens in the mid-$300 price range. But in my experience, these 6-bit screens have noticeably inferior image quality compared with their 8-bit kin, including as the Samsung 206BW on our "Best of the Best" list. That said, I can understand the appeal of the larger panel, and I've even heard from folks who are satisfied with their 22-inch screens. The best way to know if you can live with the quality-for-quantity trade-off is to check out a 22-inch screen for yourself before buying. Of the six I've reviewed, HP's W2207 got the highest verdict, an 8 (June 2007). MPC

LETTERS POLICY: *MAXIMUM PC* invites your thoughts and comments. Send them to **input@maximumpc.com.** Please include your full name, town, and telephone number, and limit your letter to 300 words. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.

COMING NEXT MONTH IN MAXIMUMPC'S

DO YOU LIKE ME? Y/N FEBRUARY ISSUE

INTERNET SECURITY 2.0

There's a whole host of new security applications that eschew the traditional anti-malware techniques. We'll tell you whether these new apps are safe and pick our favorites.

PC REMOTE CONTROL HOW-TO

Have you ever wanted to control your home PC from your office? Let us be your guide.

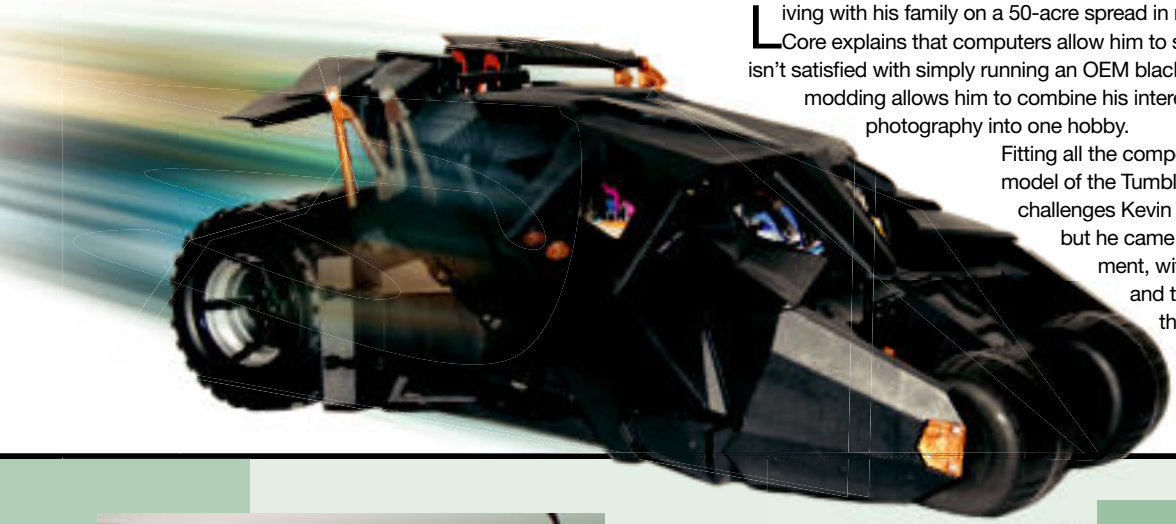
PLUS…

A very special hardware announcement that you won't want to miss!!

Sponsored by eWiz

KEVIN CORE'S

Batmobile Tumbler



Living with his family on a 50-acre spread in rural Washington, Kevin Core explains that computers allow him to stay connected. However, he isn't satisfied with simply running an OEM black box; instead, he explains, modding allows him to combine his interest in computers, cars, and photography into one hobby.

Fitting all the components into this 1/6-scale model of the Tumbler was one of the biggest challenges Kevin faced when building this rig, but he came up with a two-level arrangement, with the motherboard up top and the power supply down below, that gives all the components plenty of room to breathe.

Up next? A 1/8-scale 1932 hot rod mod.

Kevin's first step was to remove the RC car components and molded plastic from the body of the Tumbler. In this case, the Batmobile was no match for Kevin's trusty Dremel.

A total of 28 LEDs keep this rig lit up, and an optoisolator circuit allows the seven hard-drive indicator lights to work simultaneously.

For his winning entry, Kevin wins a $500 gift certificate for eWiz.com to fund his modding madness! See all the hardware deals at www.eWiz.com and turn to page 101 for contest rules.

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